Blue Ridge Environmental Defense League

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The Honorable Allison Macfarlane, Chairman
US Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Chairman Macfarlane:

On behalf of the Blue Ridge Environmental Defense League, I write regarding the ongoing deliberations on the expedited transfer of irradiated fuel to dry cask storage and the fuel pool study. Today I participated in a public meeting conducted by the Japan Lessons-Learned Project Directorate. Although it was a Category 3 meeting, inviting public comment, it was as unsatisfactory as the previous meeting on this same subject. Therefore, I am writing to you.

In June 2013 the Nuclear Regulatory Commission issued a ñ*Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor."* According to the draft, *"The study compares high-density and low-density loading conditions and assesses the benefits of post 9/11 mitigation measures. Past risk studies have shown that storage of spent fuel in a high-density configuration is safe and risk of a large release due to an accident is very low. This study's results are consistent with earlier research conclusions that spent fuel pools are robust structures that are likely to withstand severe earthquakes without leaking."* [1]

However, the shortcomings of the draft NRC study are manifold.

Prologue

The industry term ñspent fuelò is a misnomer. When something is spent, it is consumed or used up. Nuclear fuel stored in pools is full of energy but unusable because of its radioactive by-products. Irradiation in the reactor core limits the utility of the uranium fuel. Therefore, it is heat and radioactivity of *irradiated* fuel which presents the problem now under discussion.

The Fundamental Problem with the So-called Spent Fuel Study

The two factors of risk assessment are: the magnitude of the potential loss and the probability that the loss will occur. The NRC uses ñprobabilistic risk assessmentò to determine what can go

[1] U.S. Nuclear regulatory Commission, Office of Nuclear regulatory Research, Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor Draft Report June 2013

wrong, how bad it could be and how likely it is to occur *based on current information*. The problem is that probabilistic risk assessments do not account for *unexpected* failures. A physicist writing for the Bulletin of the Atomic Scientists said:

> ñThe lesson from the Fukushima, Chernobyl, and Three Mile Island accidents is simply that nuclear power comes with the inevitability of catastrophic accidents. While these may not be frequent in an absolute sense, there are good reasons to believe that they will be far more frequent than quantitative tools such as probabilistic risk assessments predict. Any discussion about the future of nuclear power ought to start with that realization.ò[2]

An earthquake is an unpredictable event. The Fukushima disaster occurred in an area with a known seismic history and to a society well adapted to living on a fault line. Charles Richter, developer of the Richter scale, said: "[Prediction] provides a happy hunting ground for amateurs, cranks, and outright publicity-seeking fakers"[3] Charles Richter, a California Institute of Technology professor of seismology, spent most of his life in this field. He assisted officials in Japan and California with earthquake engineering and safety. His description of earthquake predictors ought to be taken seriously by the Office of Nuclear Reactor Regulation, the Office of Nuclear Regulatory Research and the Office of Nuclear Material Safety and Safeguards.

For example, to estimate earthquake risks at North Anna, nuclear engineers used ñprobabilisticò techniques to describe potential ground motion. They attempt to account for all potential seismic sources in the region around the plant. The standard is ground motion that occurs every 10,000 years on average.[4] But the 5.8 scale quake in Virginia in 2011 was preceded by a 5.8 quake in 1897. Just 114 years separated the two quakes.

The draft NRC study excludes the hazards of concurrent reactor accidents that are known to impact the safety of irradiated fuel pool systems. As Dr. Thompson has said, *"the physical proximity of spent-fuel pools to operating reactors, and their sharing of safety systems, means that the use of high-density racks creates strong linkages between reactor risk and pool risk."* [5]

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[2] Ramana, NV, ñBeyond our imagination: Fukushima and the problem of assessing risk,ò *Bulletin of the Atomic Scientists*, April 19, 2011. M. V. Ramana, a physicist, is currently appointed jointly with the Nuclear Futures Laboratory and the Program on Science and Global Security, both at Princeton University, and works on the future of nuclear energy in the context of climate change and nuclear disarmament. He is the author of *The Power of Promise: Examining Nuclear Energy in India*, to be published later this year by Penguin Books. Ramana is a member of the Bulletin of Atomic Scientists Science and Security Board.

[3] Geller RJ et al, ñEarthquakes Cannot Be Predicted,ò Volume 275, Number 5306, pp. 1616, 1996, The American Association for the Advancement of Science, http://scec.ess.ucla.edu/~ykagan/perspective.html

[4] NRC frequently asked questions related to the March 11, 2011 Japanese Earthquake and Tsunami, available at http://www.nrc.gov/japan/faqs-related-to-japan.pdf

[5] Gordon R. Thompson: Comments on the US Nuclear Regulatory Commissionôs Draft Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a US Mark I Boiling Water Reactor, August 2013, p.6

As you know, it was rapid, high-energy combustion in the reactor building and refueling bay at Fukushima which damaged the irradiated fuel pools. [6]

The NRC staff dismisses aging and deterioration of Irradiated Fuel Pool Systems by ignoring a 2011 NRC-sponsored study which concludes, ñ*as nuclear plants age, degradations of fuel pools are occurring at an increasing rate, primarily due to environment-related factors. During the last decade, a number pools have had water leakage."* [7] Instead the NRC staff points to a study done 25 years ago, before aging effects were observed. If the Blue Ridge Environmental Defense League were to bring such similarly dated information before administrative judges in the license interventions we are engaged in, it would be dismissed.

The draft study does not comply with technical information safety analysis standards for reactors. Pursuant to 10 CFR 52.157, safety analyses must incorporate all key reactor station components including engineered safety features, auxiliary and emergency systems, radioactive waste handling systems, and fuel handling systems such that an individual located at any point on the boundary of the exclusion area for any 2 hour period following the onset of the postulated fission product release would not receive a radiation dose in excess of 25 rem total effective dose equivalent.

An NRC study of the San Onofre Nuclear Generating Station in California estimated that an earthquake-caused fuel pool fire could release approximately 2,500 times more radioactivity to the general public than a dry cask failure. [8] At Fukushima all of the irradiated fuel dry casks escaped damage during the earthquake and tsunami. [9]

In 2011 the Nuclear Regulatory Commissionôs Fukushima Lessons Learned Task Force concluded that enhancements to safety and emergency preparedness were warranted and made a dozen recommendations for Commission consideration. The NRC staff subsequently prioritized and expanded upon the task force recommendations on October 3, 2011 in SECY-11-0137. However, these recommendations were ignored when the Commission approved the Plant Vogtle construction and operation license in February 2012, the first such license issued in 30 years. Why were such important lessons not learned? Must we wait for an American Fukushima?

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[6] I.K. Madni, MELCOR Simulation of Long-Term Station Blackout at Peach Bottom, BNL-NUREG-44993, 1990.

[7] U.S. Nuclear regulatory Commission, A summary of Aging Effects and Their Management in Reactor Spent Fuel Pools, Refuelling Cavities, TORI and Safety-Related Concrete Structures, NUREG/CR-7111 (2011). P. vxiii. http://pbadupws.nrc.gov/docs/ML1204/ML12047A184.pdf

[8] U.S. Nuclear Regulatory Commission, Office of Nuclear Security and Incidence Response, RASCAL 3.0.5 Descriptions of Models and Methods, NUREG-1887, August 2007

[9] David Talbot, The Case for Moving U.S. Nuclear Fuel to Dry Storage, MIT Technology Review, April 14, 2011.

Senator Edward Markey, in a letter to you dated September 17, 2013, said, ñI believe the NRC draft is biased, inaccurate, and at odds with the conclusions of other scientific expertsð including those expressed in a peer-reviewed article that was co-authored by you in 2003....Instead of wasting more of NRCôs resources on studies that appear to be deliberately designed to yield a óno-actionô outcome, I urge you to direct your staff to read your 2003 paper, along with other scholarly materials on this topic, and prepare a new study that does not lack credibility.ò

Conclusion

We agree with Senator Markey, Gordon Thompson and others who say that the draft study should be withdrawn and efforts to incorporate it into the NRCs regulatory framework should be halted. NRC should start a proper investigation of the risks and consequences of pool fires. If the NRC staff lacks the capability to do this work, they should at least locate agents not dominated by nuclear industry messengers.

Respectfully,

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