

May 29, 2013

Arjun Makhijani, Ph.D.
President, Institute for Energy
and Environmental Research
6935 Laurel Avenue, Suite 201
Takoma Park, MD 20912

SUBJECT: RESPONSE TO LETTER FROM INSTITUTE FOR ENERGY AND
ENVIRONMENTAL RESEARCH

Dear Dr. Makhijani:

I am writing in response to your November 14, 2012, letter to Chairman Macfarlane of the U.S. Nuclear Regulatory Commission (NRC). I appreciate your interest and thank you for your review of the issues and the technical recommendations you provided. The NRC views nuclear regulation as the public's business and, as such, believes it should be transacted as openly and candidly as possible. The NRC has reviewed your recommendations and we provide the following responses:

1. Cancer Risks in Populations Near Nuclear Facilities Pilot Studies¹:

- a. You stated that you were not asking for a revision to the NRC mandate to proceed with both the case control and the ecologic pilot studies. However, you believe it would be useful and may help avoid controversies upon completion of the ecologic study if the panel were to pursue and publish its work in two parts - the children's case control study first and then the ecologic study, with due attention to the lessons learned from the case control study.

NRC response:

The NRC plans to share the issues you raised with the National Academy of Sciences (NAS) for their consideration as the study progresses. On your recommendation to perform the case control study prior to the ecologic studies to "avoid controversies"—the NAS Phase 1 committee stated that both pilot study designs would be complementary and the NRC sees no reason not to perform and publish both studies concurrently. Both types of studies will be useful in assessing and communicating cancer risk to the public as discussed in the Phase I report.

- b. You stated that it is important for the pilot studies to consider the effects of more than one nuclear power plant if people are living in the shadow of more than one. Specifically, Dresden and Braidwood should be considered together.

¹ See Fact Sheet on Analysis of Cancer Risk in Populations near Nuclear Facilities—Phase 1 Feasibility Study on NRC's public Web site at <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-analys-cancer-risk-study.html> for a description of the study.

NRC response:

The NAS is working independently from the NRC staff. However, the NRC staff discussions with the NAS indicate that multiple-nuclear power facilities will be considered in the dose assessment portion of the pilot study phase. Additionally, as discussed in the Phase 1 report, other sources of radiation exposure will also be considered in the analysis (e.g., medical, radon).

- c. You recommend that the NRC request the U.S. Environmental Protection Agency's (EPA's) Science Advisory Board or the NAS Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation to provide it with scientific advice as expeditiously as possible on how fetal doses in the first 8 weeks, from alpha emitters and relatively low-energy beta emitters, particularly tritium and carbon-14, should be calculated.

NRC Response:

The staff agrees that the best scientific advice should support this work. It appears to be unnecessary for the NRC to request additional advice because the NAS will be forming a new expert committee for the pilot studies that will employ state-of-the-art dose reconstruction methods, including dose assessment to the fetus. However, your comments will be forwarded to the NAS staff for their consideration.

- d. You recommend that the NRC require routine monitoring of rainwater around commercial nuclear reactors. You also believe that the NRC should encourage nuclear power plant owners to consider making funds voluntarily available to private well owners nearby in case the well-owners want to have their water tested for tritium and other radionuclides emitted from nuclear power plants.

NRC Response:

The NRC requires nuclear power plants to have both an effluent monitoring program, and an environmental monitoring program that includes measuring and reporting of tritium and carbon discharges, and monitoring radioactivity in drinking water wells. Specifically, the NRC requires nuclear power plant licensees to perform an annual land use census to identify principal pathways of exposure (10 CFR 50, Appendix I, Section IV.B.3), including identifying and sampling local drinking water wells that are most likely to be affected by radioactive effluent discharges if any impacts occurs. These annual land use censuses have not identified that tritium in rain water is a principal exposure pathway to humans. However, the drinking water wells most likely to be affected by effluent discharges are monitored, and monitoring data are reported in the licensee's radioactive effluent and environmental reports (available on the NRC Web site). Tritium, which is detected occasionally in collected rainwater, could become part of the groundwater at the site, but is not, in itself, a principal pathway of exposure to humans. Therefore, we do not believe that a separate monitoring requirement is necessary.

2. NRC's Radiation Risk Communication:

You recommend that a statement on NRC's Web site describing the risk to the public from radiation exposures be replaced with a simple statement that reflects radiation risks as presented in the BEIR VII or EPA's Federal Guidance Report 13 (FGR-13). You recommend that the word "safe" should not be used in the NRC's public pronouncements about radiation unless the NRC is certain that there has been and will be no public exposure from the situation being discussed. In that case the statement should explicitly specify that the meaning of "safe" is that there has been no radiation exposure to the public due to the problem at hand. You also recommend that guidance to that effect be provided to licensees.

NRC response:

The NRC radiation protection standards are based on the recommendations of radiation protection organizations such as the International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP). The ICRP recommendations are based on the principles of justification, optimization, and limitations; which are implemented by the NRC in the form of public dose limits and a requirement to minimize radiation dose to members of the public to "as low as is reasonably achievable." The result of implementing these standards is actual releases and exposures that are very small fractions of the regulatory limits. In addition, the radiation doses to the highest exposed members of the public, even those living close to nuclear plants, have been a very small fraction (typically less than 1 percent) of the natural background radiation dose. The NRC's information on site-specific radiation doses, effluent reports and environmental reports for each of the nuclear power plants are available to the public via the NRC Web site.

The original source of the information on the NRC Web site on exposures within the U.S. population is Report 160 of the NCRP. Scientific efforts continue to help refine our understanding of the mechanisms of health effects at levels of dose and dose rate near, and below, the levels of background radiation experienced by each of us every day. Other statements on our Web site elaborate on the potential effects of radiation exposures, including a discussion of the linear, no-threshold dose response relationship. Given the state of knowledge, we believe that the statements on the Web site are accurate, and discuss the risk of radiation exposures and relevance of exposures from regulated activities within the wide variety of exposures from other sources. The NRC uses the word "safe" in the context of reasonable assurance of adequate protection.

The NRC staff is monitoring the ongoing work by EPA, and working with other Federal agencies through the Interagency Steering Committee on Radiation Standards (ISCORS), to examine the approaches for revision and update of EPA, NRC, and other Federal agencies' standards in the area of radiation protection. EPA published their revision of the Radiogenic Cancer Risk Models and Projections for the U.S. population in 2011, and is now beginning work to update FGR-13. Through ISCORS, the NRC is seeking to align the approaches of all the agencies for a scientifically up-to-date set of methodologies which ensure adequate protection of the public health and safety.

The NRC is also aware of the work being done for EPA to re-examine the risks from exposure to low energy beta and gamma radiation, including tritium. Through our interaction with ISCORS and EPA, we understand that those efforts are likely to result in an increase in tabulated values for cancer risk estimates in FGR-13. For public dose calculations for nuclear power plant effluent releases, the NRC provides guidance for use of more conservative dose modeling based on a relative biological effectiveness factor of 1.7 (vs. 1.0) from ICRP-2 than the value used in FGR-13. As noted previously, the dose being received by the public from nuclear power plant radioactive releases is very small, and therefore an increase in risk coefficients would not be expected to result in a substantial increase in public cancer risk.

3. 10 CFR Part 61

- a. You recommend that organ doses as defined in FGR-13 be included in radiation protection rules, including any revision of 10 CFR Part 61, Subpart C, and that the present numerical limits be maintained, if not tightened. Since the rule is being revised, you recommended that the rule explicitly define a “member of the public” for purposes of compliance assessment as including males and females and people of all ages from infants up.
- b. You also recommend that if the period of performance for low-level waste disposal is to be limited (at present there is no limit in Subpart C), then there should be strict limits on both the concentrations and the total curie amounts of long-lived radionuclides that can be disposed of in a facility licensed under 10 CFR Part 61.
- c. You recommend that radionuclides with half-lives of more than 10 years should be defined as long-lived in the Part 61 rulemaking. Your reasoning is that 10 such half-lives is a reasonable period for assuming the existence of institutional controls. You also recommend that all other low-level wastes, including (but not only) depleted uranium from enrichment plants and Greater-Than-Class C waste as currently defined should be designated for deep geologic disposal.

NRC Responses to a., b., and c. Above:

As you know, the NRC is developing proposed revisions to 10 CFR Part 61, our low-level waste disposal regulations. The proposed rule is in the final stages of development and is to be sent to the Commission later this year. If and when the Commission approves the proposed rule, it will be published in the *Federal Register* for comment. We will add your letter to the docket and address your comments on 10 CFR Part 61 as part of the public comment process.

- d. You stated that the NRC should insist on scientific integrity and quality assurance in its own work and that of the Agreement States, especially in documents having to do with licensing. You assert that this has not happened despite what you have characterized as the “truly fantastic nature” of some errors in a particular report. You reference the license renewal for the EnergySolutions, Clive, Utah, facility and the NRC’s licensing of the Louisiana Energy Services National Enrichment Facility. You believe some of the information provided in the report, “*Evaluation of the Potential Public Health Impacts*

Associated with Radioactive Waste Disposal at a Site Near Clive, Utah” by R. D. Baird to be scientifically absurd. You have stated that the information in this report formed the basis for the State of Utah’s performance assessment for the disposal of radioactive material at the Clive, Utah, facility and the granting of the license to EnergySolutions. You also recommended, in comments submitted by your client, Heal Utah, to the State of Utah, that this report should not be reviewed with regard to the license renewal process and that another environmental analysis should be performed with respect to the license renewal.

NRC response:

With respect to licensing of the disposal facility in Clive, Utah, the State of Utah is the regulatory authority for this facility. The Utah Division of Radiation Control has the authority to use whatever resources it chooses in making its licensing decisions. After review of the performance assessment provided by the State of Utah, it appears that none of the information that you cited is referenced by the State of Utah with respect to their license renewal decision. Based on discussions with the State of Utah regulators, it is our understanding that the 1990 report was not used to support the currently effective license, which was most recently renewed in 2008. The license is in the renewal process and will use new analyses for the support for the proposed new license. We believe the report you reference is outdated and it is not being used for current regulatory decisions.

In your letter, you refer to “physically impossible” concentrations of uranium and other radionuclides in the Baird report.² You state that NRC staff declared the report to be scientifically sound, even with these anomalous numbers. These calculated concentrations are artifacts from the modeling used to help determine the limiting exposures scenarios for the site and for establishing concentration limits in the license. They are, as you note, physically impossible. They were derived from the intruder explorer scenario into the disposal facility. As described on page 5-4 of the Baird Report, this scenario involves an individual spending 1000 hours per year on the site, without digging into the cover or waste. The only exposure mechanism is from direct gamma exposure from the covered waste. The calculated concentrations to reach the 25 mrem/yr dose limit for this scenario are physically impossible. Based on our discussions with Utah officials, we understand that the State of Utah only used this information to conclude that the intruder explorer scenario was not a controlling scenario in the initial licensing of the site which was completed in 1991. It was not used any further. Since that time, the State of Utah reportedly has conducted additional analyses that were used to support the current waste concentrations in the current license. The current license uses the Class A limits for the waste acceptance criteria and the analysis of those values was evaluated in the 1999–2000 timeframe. The State of Utah is currently evaluating the license renewal.

² R.D. Baird, M.K. Bollenbacher, E.S. Murphy, R. Shuman, and P.B. Klein, "Evaluation of the Potential Public Health Impacts Associated with Radioactive Waste Disposal at a Site Near Clive, Utah," Rogers and Associates Engineering Corporation, June 1990 (RAE-9004/2-1)

With respect to the licensing of the LES facility, you testified before NRC's Atomic Safety and Licensing Board in October 2005 concerning the dispositioning of uranium tails from that facility. As part of your testimony, you discussed the "physically impossible" uranium concentrations in the Baird report. In addition to the information presented above concerning this issue, the Atomic Safety and Licensing Board issued its decision on the dispositioning of uranium tails from LES on June 6, 2006.³ Their decision refers to your testimony, which was considered by the Board. Their decision also describes the basis for concluding that LES had a plausible strategy for dispositioning of uranium tails.

In summary, I appreciate your interest and thank you for your review of the issues and technical recommendations that you provided in your letter. If you have any additional issues that you would like to advise me of, or would like any additional insight into NRC's regulatory programs, please contact me.

Sincerely,

/RA/

Mark A. Satorius, Director
Office of Federal and State Materials
and Environmental Management Programs

³ Atomic Safety and Licensing Board, Memorandum, Docket No. 70-3103-ML, ASLBP No. 04-826-01-ML, June 6, 2006.

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Sincerely,

/RA/

Mark A. Satorius, Director
Office of Federal and State Materials
and Environmental Management Programs

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OFC	MSSA	DWMEP	DWMEP	DWMEP	FSME
NAME	DWhite	GSuber	AMohseni	LCamper	CPoland
DATE	5/01/13	4/30/13	5/7/13	5/8/13	5/9/13
OFC	FSME	EDO	FSME		
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DATE	5/14/13	5/16/13	5/29/13		

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⁴ Atomic Safety and Licensing Board, Memorandum, Docket No. 70-3103-ML, ASLBP No. 04-826-01-ML, June 6, 2006.