



## RADIOACTIVE WASTE MANAGEMENT ASSOCIATES

November 19, 2015

Secretary

U.S. Nuclear Regulatory Commission

Washington, D. C. 20555-0001

ATTN: Rulemaking and Adjudications Staff

Subject: docket ID NRC – 2015 – 0057

This letter transmits comments on the petitions for rulemaking filed with the US Nuclear Regulatory Commission concerning linear no threshold model standards for protection against radiation (PR – 20 – 28, PRM – 20 – 29 and PR – 30).

Sincerely,

A handwritten signature in black ink, appearing to read "Marvin Resnikoff", is written over a large, light-colored diagonal line that extends from the top right towards the center of the page.

Marvin Resnikoff

Senior Associate

## **Comments by Radioactive Waste Management Associates (RWMA) on linear no threshold model standards for protection against radiation; notice of docketing and request for comment ID: NRC – 215 – 0057 – 0010**

RWMA strongly disagrees with the petition to the Nuclear Regulatory Commission (NRC) to cease using the linear no-threshold (LNT) model as a basis for regulating exposures to ionizing radiation. The petition ignores strong evidence from peer-reviewed journals in support of the LNT. Our comments discuss two aspects of this issue: 1) the relationship between X-ray doses to pregnant women and a statistically significant increased incidence of leukemias to children, and 2) a major change in UNSCEAR reports between the years 2000 and 2013 which completely obfuscate the initial findings of the impact of low radiation doses on children, without any new additional evidence to support the reversed finding. The X-ray doses to pregnant women were low doses, on the order of 1 to 2 rems, and showed a statistically significant increased cancer rate.

### **X-Ray Doses to Pregnant Women and Childhood Leukemias**

In 1956 Dr. Alice Stewart and her colleagues first published results of a case-control study of childhood cancer mortality in Britain during the early 50s. The detailed study results appeared in in 1958 in the British Medical Journal.<sup>1</sup> The relative risk to a child due to an x-ray examination of the pregnant mother was 2 and the results were statistically significant. Dr. Stuart continued this study which later became known as the Oxford Survey of Childhood Cancers to 1984. Thousands of pregnant women were included in the study, along with a corresponding control group. There were four criticisms of the study which have subsequently been refuted. I won't go into the criticisms and the refutations. A discussion of the criticisms and why where they were not well taken appears in articles by Drs. Wakeford, Doll and Bithell<sup>2</sup> and also by Drs. Doll and Wakeford.<sup>3</sup> But the conclusion is the following that doses on the order of 10 mGy (1 Rad) received by the fetus in utero cause a subsequent increase in the risk of cancer; the excess actual risk coefficient of child cancer incidence is 6 to 12% per Gy. The bottom line is that low radiation dose to the fetus in utero increase the risk of cancer to children. That is the evidence supports a dose-response relationship for radiation-induced cancer which approaches zero dose with a positive slope.

### **UNSCEAR**

Between the years 2000 to 2013, UNSCEAR has changed its opinion on the LNT without citing additional evidence.<sup>4</sup> It is not clear if this change was purposeful or simply a slight secretarial

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<sup>1</sup> Stewart, A, Webb, J and Hewitt, D, A Survey of Childhood Malignancies, June 28, 1958, 1496 – 1511.

<sup>2</sup> Wakeford, R. R. Doll and JF Bithell, IAEA-CN-67/123

<sup>3</sup> Doll, R and Wakeford, R, Risk of Childhood Cancer from Fetal Irradiation, Br J Radiol 70 (1997), 130-139.

<sup>4</sup> The astonishing findings reported here were uncovered by Dr. Ian Goddard.

omission but the bottom line is important because UNSCEAR has been used as an important reference. I'll put the pertinent paragraphs below.

**UNSCEAR2000:**

In UNSCEAR 2000, UNSCEAR acknowledges low doses to children and a significant cancer risk.

“37. For most tumour types in experimental animals and in man a significant increase in risk is only detectable at doses above about 100 mGy. An exception is for human exposures in utero when a significant increase in tumour induction in children has been found for doses in the 10-20 mGy range (low-LET). No such excess was observed in the studies of Japanese atomic bomb survivors irradiated in utero.”

**UNSCEAR2008:**

This conclusion changed in UNSCEAR 2008 and UNSCEAR 2013.

“D251. In order to adequately interpret and communicate radiation risk projections, it is necessary to understand their scientific limitations. At today's level of knowledge, there are reliable epidemiological data on risks of cancer morbidity and mortality due to radiation exposure of cohorts of individuals with an acute average dose of the order of 100 mSv and above. So far, neither the most informative LSS study nor any other studies have provided conclusive evidence of carcinogenic effects of radiation at smaller doses. **This is the position formulated by UNSCEAR in annex G, “Biological effects of low radiation doses”, of the UNSCEAR 2000 Report [U3], which states “There is substantial and convincing scientific evidence for health risks at high dose. Current summarized data, which represent international consensus, show that radiation-induced cancer cases (excess above background cases) could be observed in humans at effective doses in excess of 0.1Sv delivered at high dose rates”.**

**UNSCEAR2013:**

This incorrect conclusion is repeated in UNSCEAR2013.

“E35. Most of the radiation-induced leukaemia risk after exposure during infancy would be expressed during childhood. WHO estimated the risk of leukaemia for the first 15 years after exposure during infancy. An absorbed dose of 26 mGy to the red bone marrow was estimated to increase the risk from a baseline of 0.03% to 0.05% [W12]. This is slightly lower but broadly consistent with some recent studies of childhood leukaemia after radiation exposure [W5]. The Committee's estimates of exposure were lower than those of WHO. Considering the exposures and risks, and the size of the exposed group, any increase in childhood leukaemia is not expected to be discernible.”

That is, in UNSCEAR2013, the risk to children 15 years of age or less is not “discernible.” So the lie from 2008 is repeated in UNSCEAR2013. In short, in 2008, though referring back to UNSCEAR2000, UNSCEAR completely omits the low dose risk to children, or perhaps believe that children are not human. UNSCEAR2013 appears to double down on this “fact.” All of this is important because the UNSCEAR reports have been used as authoritative sources for radiation health effects.

### **Conclusion**

Contrary to the assertions by the petitioners, low doses of radiation do cause an increase in the cancer rate that is statistically significant.