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TESTIMONY SUBMITTED TO  
THE SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS  
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The purpose of this brief testimony is to provide preliminary data to support the contention that the current 10-mile radius of the emergency planning zone for plume exposure (“plume exposure EPZ”) is inadequate, in the event of a beyond-design-basis (“severe”) accident or terrorist event at a commercial nuclear power plant, and will fail to protect the public in accordance with Federal guidelines. Therefore, the call for an extension of the emergency planning zone to 50 miles contained in S.1746, “Nuclear Security Act of 2002,” is an appropriate and prudent measure that merits serious consideration. In fact, such a change will be necessary to provide the level of protection now called for by FDA and EPA in the event of a severe nuclear reactor accident.

We have used the MACCS2 code to generate estimates of thyroid dose and total effective dose equivalent (TEDE)<sup>1</sup> to members of the public downwind of a severe radiological release at a nuclear power plant, involving core melt, vessel breach and containment failure.<sup>2</sup> The total radioactive iodine release assumed is about 60% of the core inventory, similar to the release from the Chernobyl accident. The calculated doses assume only exposures due to passage of the initial plume and due to deposited contamination for one week following the accident; thus long-term doses are not considered. Ingestion doses (the milk pathway) are also not considered. The calculations are for a generic pressurized-water reactor and a single meteorological condition (atmospheric stability class D, wind speed 4.4 miles per hour, and no precipitation). The exposed individuals are assumed to be 30-year-old adults. Other assumptions for this model, including the source term, can be found in a recent publication.<sup>3</sup> The intent here is not to be comprehensive, but simply to demonstrate the severity of these events.

The pertinent results are summarized in the following table:

<sup>1</sup> TEDE is the sum of the dose due to external radiation and the “committed effective dose” delivered for up to a 50-year period as a result of internal exposure resulting from radionuclide intake.

<sup>2</sup> D.I. Chanin and M.L. Young, *Code Manual for MACCS2: Volume 1, User's Guide*, SAND97-0594, Sandia National Laboratories, 1997.

<sup>3</sup> Edwin S. Lyman, “Public Health Risks of Substituting Mixed-Oxide for Uranium Fuel in Light-Water Reactors,” *Science and Global Security* 9 (2001) 33-79.

*Strategies for stopping the spread and reversing the growth of nuclear arms.*

	Peak Thyroid Dose (rem):	Peak TEDE (rem):
Distance (miles)		
15	626	163
28	292	60
45	254	38

The relevance of these values is as follows:

Thyroid prophylaxis. According to the FDA's recent guidance on the administration of potassium iodide (KI) as a prophylactic measure, it is recommended that adults between the ages of 18 and 40 take 130 mg of KI daily if their thyroid exposure is projected to exceed 10 rem.<sup>4</sup> From the table, it can be seen that this threshold is exceeded by a factor of 25 for the most affected individuals at a distance of 45 miles. Thus according to FDA guidance, KI administration would be recommended for some individuals located at least 45 miles downwind of the accident.

The situation is even more severe for children and pregnant or lactating women. For these individuals, the FDA recommends KI prophylaxis if the projected thyroid dose is greater than 5 rem. To convert the thyroid doses in the above table, which were estimated for 30-year-old adults, to children, who would receive a larger thyroid dose for the same radioactive iodine intake, a factor of between two and ten should be applied, depending on the age.<sup>5</sup> Thus the thyroid dose to children could exceed the FDA threshold for KI administration at even greater distances than for adults.

Evacuation. According to the EPA "protective action guides" (PAGs), evacuation should normally be initiated if the total effective dose equivalent (TEDE) exceeds 1 rem.<sup>6</sup> It is obvious from the above table that according to this rule, evacuation would be recommended at more than 45 miles downwind from the site.

Conclusion. The 10-mile plume exposure EPZ was never intended to provide significant protection against the long-term carcinogenic effects of radiation exposure, but was only intended to reduce the early fatalities that could occur from acute radiation poisoning. Nevertheless, the ultimate long-term health consequences of a severe radiological release would be catastrophic, and the government must be obliged to ensure that these longer-term effects be avoided to the maximum extent possible. Thus an extension of emergency planning to a region extending at least 50 miles downwind of nuclear reactor sites is an essential measure to bolster protection of the public in the event of a terrorist attack on a nuclear plant.

<sup>4</sup> U.S. Department of Health and Human Services, Food and Drug Administration, Center for Drug Evaluation and Research, "Potassium Iodide as a Thyroid Blocking Agent in Radiation Emergencies," Guidance Document, November 2001. Available on the Web at [www.fda.gov/cder/guidance/index.htm](http://www.fda.gov/cder/guidance/index.htm).

<sup>5</sup> International Commission on Radiological Protection (ICRP), *Age-Dependent Doses to Members of the Public From Intake of Radionuclides, Part 5*, ICRP Publication 72, Vol. 26, No 1 (1996).

<sup>6</sup> T. McKenna, J. Tefethen, K. Gant, J. Jolicoeur, G. Kuzo and G. Athey, *RTM-96: Response Technical Manual*, NUREG/BR-0150, Vol. 1, Rev. 4, U.S. Nuclear Regulatory Commission, March 1996, p. G-7.