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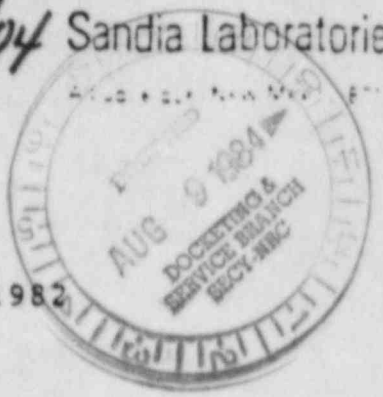
Sandia Laboratories



November 12, 1982

Dr. N. J. Palladino, Chairman
US Nuclear Regulatory Commission
Washington, DC 20555

Dear Dr. Palladino:

Subject: Comments on Washington Post/Wire Service Reports

On behalf of Sandia National Laboratories, I wish to correct impressions left by the Washington Post articles and subsequent wire service reports on reactor accident consequences.

These reports seriously misinterpret our draft reports and other preliminary information. The net result is that the public has been given a very distorted and confusing picture of nuclear power reactor accident probabilities and consequences.

Information generated in our study should not be employed to evaluate risk or accident consequences for actual operating plants at US sites. The assumptions embodied in our analyses render the results inappropriate for this purpose. Further, as demonstrated in our report, our calculations are sensitive to key input variables, such as the release source term and assumed emergency response. In most cases, conservative assessments of these parameters have been made consistent with the intended use in establishing defensible siting criteria. Hence, our results should not be depicted as our most realistic assessment of accident consequences.

In any case, the peak values of consequences that the Washington Post reported correspond to a range of accident probabilities that has no practical significance. The likelihood of experiencing the Post peak consequences for a given plant is about once in a billion years (about 1/5 the age of the earth). This comes from the assessed likelihood of a large release (requiring core meltdown, with simultaneous failure of all engineered safety features and breach of containment) as once in one hundred thousand years of reactor operation. This probability is then further lowered by the one

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U.S. NUCLEAR REGULATORY COMMISSION

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in ten thousand chance of simultaneously experiencing the most unfavorable wind direction, dispersion, occurrence of rain, and other meteorological phenomena.

Our study was performed for the Nuclear Regulatory Commission (NRC) to provide technical guidance to support rulemaking for siting of power reactors. The study was performed for the Offices of Nuclear Reactor Regulation and Nuclear Regulatory Research. Personnel from both offices have been deeply involved with the conduct of our work. A draft of the final report "Technical Guidance for Siting Criteria Development," NUREG/CR-2239, has been given to NRC. This report is undergoing technical peer/management review at Sandia.

As part of our study, calculations were made of the range of consequences for hypothetical reactor accidents. The purpose of this investigation was to determine the sensitivity of predicted accident consequences to site characteristics (such as population distribution, meteorology, and emergency response) and accident characteristics (such as source term and physical behavior of release). The objective was to develop an improved technical basis for rational decisions regarding power plant siting.

Calculations were performed for five Siting Source Terms (SST1-5) which were prescribed by the NRC staff. Only SST1 (a very large release) produced substantial numbers of early health effects. Hence, our sensitivity calculations involving siting/emergency response emphasize this release. The calculations were performed using available population and meteorological data for 91 US reactor sites. However, a standard 1120 MWe pressurized water reactor (PWR) was assumed at all sites (irrespective of the actual reactors at the site, which range from 50 MWe to 1288 MWe). No attempt was made to match plant characteristics (predicted core melt frequency, containment effectiveness, etc.) to the site characteristics. As is obvious from this discussion, and which is emphasized throughout our report, our calculations do not represent risk or accident consequences for existing reactor/site combinations.

The Washington Post compiled its table of peak consequences by selectively extracting values from raw computer output from the CRAC2 code. We gave microfiche of this output to NRC last year.

The peak consequences are the extreme values of the calculated probability distributions. Accidents involving peak consequences are so improbable that they make negligible contribution to risk.

In any technical study, one cannot decouple production of computed results from expert judgement by the authors regarding the uses, interpretation, and validity of the results.

In our judgement, the peak values of consequences have no practical significance. Consequently, we did not tabulate peak values of consequences in our report.

The last column in the Washington Post table reported "scaled financial consequences." These numbers were taken from another draft Sandia report "Estimates of Financial Consequences of Nuclear Power Reactor Accidents," NUREG/CR-2723. The Post article and subsequent wire service reports indicated that the tabulated values represent the potential financial consequences of a reactor accident. This is incorrect.

The numbers abstracted from NUREG/CR-2723 are estimates of the expected cost of accidents over the lifetime of the plant, scaled by the frequency of release. These results properly used, illustrate that the societal financial risk of reactor accidents is indeed quite small. For instance, the Post incorrectly determined the worst case accident at Indian Point Unit 3 as having financial damages of about 300 billion dollars. Properly used, the 300 billion number should be multiplied by the frequency of a "Group 1" accident (assigned a frequency of 10^{-5} per year) to obtain about 3 million dollars as the total expected cost of such accidents for the remaining 34 years of plant life. For other sites, the expected costs are even lower. Values of financial risks provide a technical basis for decisions regarding cost-effective safety improvements.

As is emphasized in our report and the NRC foreword, the SST releases defined by NRC for their siting/emergency response evaluations may significantly overestimate actual releases, perhaps by a factor of ten or more. This would have a dramatic effect on predicted consequences, particularly for early fatalities which have a "threshold" effect. The study demonstrates that a factor of ten reduction in source term would reduce mean early fatalities by a factor of one hundred or more.

The predicted consequences are also very sensitive to other factors, such as assumed times and effectiveness for evacuation, sheltering, or other emergency actions. These sensitivities of predicted consequences are detailed in our report.

In our judgement, the consequence values cited in our report overestimate actual consequences - perhaps by a large amount - due to assumptions employed for source term and emergency response. Although we feel that the information we have generated is very useful for informed decision makers to make prudent technical decisions concerning siting and emergency response, or cost-effective improvements in plant safety, the information has been very badly misused in reporting to the public.

I hope that this information will be useful in preparing your response. Please call me if we can be of further assistance.

Sincerely,