February 10, 2014

Dr. Edwin Lyman
Senior Scientist, Global Security Program
Union of Concerned Scientists
1825 K St. NW, Ste. 800
Washington, DC 20006-1232

Dear Dr. Lyman:

Thank you for participating in the January 6, 2014, briefing to the Nuclear Regulatory Commission (NRC), "Briefing on Spent Fuel Pool Safety and Consideration of Expedited Transfer of Spent Fuel to Dry Casks." During your remarks, you commented that the NRC staff's analysis on expedited transfer of spent fuel was incomplete to make any decision without an uncertainty analysis. You elaborated that (quoted from the transcript):

> *One consequence in the uncertainty analysis, you may remember, in the SOARCA study, the staff trumpeted the fact that there were zero acute fatalities. That was one of the main talking points that they presented to the public. Well, in the uncertainty analysis, they find out that's not true anymore. There are many scenarios where there are acute fatalities. So I would submit that until that uncertainty analysis is done, you don't have the full range of information to make this decision.*

For the reasons provided below, we do not believe you accurately characterized the results of our work and our conclusions. In the State-of-the-Art Reactor Consequence Analyses (SOARCA) plain-language summary brochure, "Modeling Potential Reactor Accident Consequences," NUREG/BR-0359 [ML12347A049], a key result noted that: "Both mitigated (operator actions are successful) and unmitigated (operator actions are unsuccessful) cases of the modeled severe accident scenarios in SOARCA cause essentially no risk of death during or shortly after the accident" (p. iii). The SOARCA summary report, NUREG-1935 [ML12332A057] states that "SOARCA's analyses show essentially zero risk of early fatalities" (p. xvi). In those statements, "essentially no risk of death" and "essentially zero risk of early fatalities" do not equate to "no fatalities," but rather a very low risk of a fatality.

Early fatalities are possible when certain dose thresholds are exceeded for deterministic health effects. The SOARCA Surry Integrated Analysis, NUREG/CR-7110, Vol. 2 [ML13240A242], reported a conditional individual early fatality risk (assuming the accident occurs) on the order of 10^{-6} per year and an absolute risk on the order of 10^{-14} per year for the Surry unmitigated interfacing system loss-of-coolant accident scenario (ISLOCA). This was characterized as "risk is so low that for practical purposes it is zero" (p. 7-19). The SOARCA Peach Bottom Integrated Analysis, NUREG/CR-7110 Vol. 1 [ML13150A053], reported that the largest value of the mean, acute dose for the closest resident did not exceed the most sensitive dose threshold in the unmitigated long-term station blackout scenario (LTSBO).

Staff subsequently completed a draft Uncertainty Analysis (UA) [ML13186A190] for the unmitigated LTSBO scenario at the pilot boiling-water reactor plant, Peach Bottom (PB) (which also is the reference plant in the spent fuel pool study). Similar to the SOARCA Surry ISLOCA noted in the above paragraph, the PB UA also calculated a non-zero, albeit minute, early fatality risk. The PB UA calculated a peak conditional mean individual early fatality risk (assuming the accident occurs) on the order of 10^{-6} per year within 1.3 miles. Considering the scenario frequency (~$3x10^{-6}$ per reactor year) puts the absolute risk on the order of 10^{-12} per year. Non-zero early fatality risk results were possible in the PB UA only by combining tails of the distributions of source terms, MACCS parameters (such as threshold for deterministic health effects), and weather conditions. In the PB UA, staff calculated a non-zero early fatality risk within 2.5 miles in ~13 percent of the 865 Monte Carlo variations representing state-of-knowledge uncertainties. Even in these 13 percent of Monte Carlo cases, a very small fraction of potential weather conditions (on the order of ~5 percent or less of the 984 representative weather trials) can result in exceeding the most sensitive dose threshold, and 95 percent or more of the weather conditions result in zero early fatalities.

In summary, the NRC staff concluded that even when the conservative bound of uncertainties is evaluated, although the early fatality risk is no longer zero, it is still so low (~10^{-12}) that for practical purposes it is zero. We chose to characterize this result as “essentially zero” for better understanding by the general public. Moreover, the staff concluded that the PB UA corroborated the conclusions of the SOARCA study. Thus, we believe that your suggestion, that early fatalities are predicted when uncertainties are accounted for, does not properly characterize the SOARCA studies’ results.

Sincerely,

/RA/ (for K. Gibson)

Kathy Halvey Gibson, Director
Division of Systems Analysis
Office of Nuclear Regulatory Research

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