



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555-0001**

March 20, 2017

The Honorable Kristine L. Svinicki
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: PROPOSED REVISION TO NUREG-1530, "REASSESSMENT OF NRC's
DOLLAR PER PERSON-REM CONVERSION FACTOR POLICY"

Dear Chairman:

During the 641st meeting of the Advisory Committee on Reactor Safeguards, March 9-11, 2017, we reviewed SECY-17-0017, "Proposed Revision to NUREG-1530, 'Reassessment of NRC's Dollar per Person-Rem Conversion Factor Policy'." Our Regulatory Policies and Practices Subcommittee reviewed this matter on February 7, 2017. During these meetings, we also reviewed proposed changes to the related document, NUREG/BR-0058, "U.S. Nuclear Regulatory Commission Guidance on Performing Cost-Benefit Analyses." We will comment on NUREG/BR-0058 separately. We had the benefit of discussions with representatives of the NRC staff and the benefit of the referenced documents.

CONCLUSION AND RECOMMENDATIONS

1. The staff's systematic process to derive a contemporary basis for the dollar per person-rem value is an important improvement to support NRC cost-benefit analyses. NUREG-1530, Revision 1, should be issued.
2. A further revision to NUREG-1530 should be developed. That revision should characterize and quantify the uncertainty in the dollar per person-rem value.

BACKGROUND

When it was published in 1995, NUREG-1530 proposed \$2,000 per person-rem as a value to be used in regulatory cost-benefit analyses that account for the health effects from radiation doses. The guidance also separated the estimation of other offsite economic consequences from this factor. Subsequently, SECY-14-0002, "Plan for Updating NRC's Cost-Benefit Guidance," established a two-phased approach to revise cost-benefit guidance documents. The first phase

is focused on structural and administrative issues, such as updating guidance for replacement energy costs and updating the dollar per person-rem value. The second phase will identify and discuss potential policy issues for Commission consideration, as necessary. Updated documents produced by the staff as part of the first phase include draft Revision 1 to NUREG-1530 and draft Revision 5 to NUREG/BR-0058. Draft Revision 1 of NUREG-1530 was issued for public comment in September 2015 and the staff has addressed comments on the revision.

DISCUSSION

The dollar value assigned to a person-rem of exposure is derived from the product of two estimates.

- The value of a statistical life (VSL). This is an estimate of the amount of money that our society is willing to pay to further reduce small risks of premature death. The VSL concept is used throughout the federal government to monetize the health benefits from a proposed safety regulation. It is important to emphasize that it is not a measurement of the value of an individual human life.
- The cancer mortality risk coefficient. This is an estimate of the probability of cancer mortality attributable to radiological exposure.

As used in NUREG-1530, Revision 1, the cancer mortality risk coefficient differs from the total cancer risk coefficient in that it accounts only for health effects that are severe enough to result in a fatality. The total cancer risk coefficient includes allowances for fatal and nonfatal cancers and for severe hereditary effects. The nonfatal cancers and hereditary effects are translated into loss-of-life measures based on a perceived relationship between quality of life and loss of life.

The 1995 version of NUREG-1530 used a VSL of \$3 million and a total cancer risk coefficient of 7.0×10^{-4} per person-rem to derive a value of approximately \$2,000 per person-rem. It did not include a method for adjusting this value over time.

To promote consistency with other federal agency evaluations, as part of Revision 1 of NUREG-1530, the staff conducted a survey of several agencies to examine their estimates of VSL and to understand how those estimates are used to support regulatory decisions. The survey revealed reasonable consensus among the “best estimate” values that are used by several agencies. The staff selected a nominal “best estimate” of \$9 million, informed primarily by an average of the values recommended for use by the Environmental Protection Agency (EPA) and the Department of Transportation (DOT)¹. The survey identified much larger variability in the range of “high” and “low” estimates used by each agency. The staff’s evaluations propose a nominal “high” estimate of \$13 million, which is similar to the high values used by the Office of Management and Budget (OMB) and the DOT. The staff’s nominal “low” estimate is \$4.5 million. That value is the average of the low values used by the OMB, DOT, and the Department of Homeland Security. It also provides approximately symmetric estimates for the low and high values around the staff’s best estimate.

¹ All dollar values are indexed to 2014, as reported in NUREG-1530, Revision 1.

For the cancer mortality risk coefficient, the staff used the current EPA estimate of 5.8×10^{-4} fatality per person-rem. The EPA characterizes their uncertainty in that estimate by a 90 percent confidence interval with a range from 2.8×10^{-4} to 1.0×10^{-3} .

The staff's updated nominal value of \$5,200 per person-rem is the product of the VSL value of \$9 million and the cancer mortality risk coefficient of 5.8×10^{-4} fatality per person-rem, rounded to two significant figures. This calculation provides an appropriate "best estimate" value, based on the supporting information. In a statistical sense, it is the mean value or the expected value of the composite uncertainty distribution. The staff's systematic process to derive a contemporary basis for this estimate is an important improvement to support NRC regulatory analyses. NUREG-1530, Revision 1, should be issued.

The staff has proposed a "low" value of \$2,600 per person-rem and a "high" value of \$7,800 per person-rem for the specific purpose of performing sensitivity calculations in regulatory cost-benefit analyses. These values are not derived from a formal evaluation of the uncertainties in the underlying parameters or a quantitative assessment of how those uncertainties affect the overall uncertainty in the dollar per person-rem value. Based on the supporting information in NUREG-1530, Revision 1, one can estimate that these values span the central portion of the uncertainty distribution, accounting for perhaps 50% to 70% of the overall range of uncertainty. For example, if a decision-maker desires confidence that cost-benefit estimates account for at least 90% of the uncertainty in this parameter, values beyond the nominal sensitivity bounds are needed to provide that confidence.

We were informed that the staff adopted the use of sensitivity analyses because the practice is consistent with that of other federal agencies. The guidance in Revision 5 of NUREG/BR-0058, however, cites the Commission's policy on the use of probabilistic risk assessment methods to support regulatory decision making. In particular, it emphasizes the importance and benefits from quantitative evaluation and reporting of the sources and magnitudes of uncertainties. The values proposed for sensitivity calculations in Revision 1 of NUREG-1530 are not consistent with the intent of the guidance in NUREG/BR-0058 or the extensive quantitative evaluations of uncertainties in other elements of the cost-benefit analyses. Sufficient information is available from surveys of other federal agency estimates and practices for the staff to quantify the uncertainty in the VSL, for the specific purposes of NRC cost-benefit analyses. The EPA has quantified the uncertainty in their cancer mortality risk coefficient. The resulting composite uncertainty in the dollar per person-rem value could then be quantified in a straightforward manner and used directly to support regulatory cost-benefit analyses, without the need for arbitrarily-selected values and limited sensitivity calculations. The best estimates and uncertainties in the supporting parameters could also be updated consistently in a transparent manner as additional knowledge and information evolve. A further revision to NUREG-1530 should be developed. That revision should characterize and quantify the uncertainty in the dollar per person-rem value to be used for NRC cost-benefit analyses.

We ask that the staff meet with us soon to develop a suitable approach for addressing uncertainty in the dollar per person-rem value. The EPA and their science advisory board have recommended treating uncertainty and the EPA guidance provides a probability distribution for this purpose. A great deal of additional work has been done by the EPA and others to examine society's investment per statistical death averted. There are now well-founded studies of such expenditures and of elicited expert judgment about these expenditures, giving the field a basis in experience. We look forward to working with the staff.

Sincerely,

/RA/

Dennis C. Bley
Chairman

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