



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

June 21, 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 644<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards, June 7-9, 2017, we reviewed the NRC staff's May 1, 2017 letter regarding disposition of the conclusion and recommendations in our referenced letter of March 20, 2017.

Our letter recommended that the staff issue Revision 1 of NUREG-1530 and that a further revision to NUREG-1530 be developed that would characterize and quantify the uncertainty in the 'dollar per person-rem value'. We offered to meet with the staff as they develop a suitable approach. The staff responded that they disagree with the Committee's recommendation to further revise NUREG-1530, stating that the sensitivity analysis approach is an appropriate means of treating uncertainty associated with the dollar per person-rem value. We do not find the staff's argument convincing for two reasons: the approach is inconsistent with the agency's guidance on the treatment of uncertainty and the argument is incorrect technically.

**Inconsistency with Guidance on the Treatment of Uncertainty**

NUREG/BR-0058 provides guidance that assists analysts to account for uncertainty in cost-benefit analyses. The 'dollar per person-rem value' is used in those analyses. This dollar per person-rem value is calculated as the product of the cancer mortality risk coefficient (effectively, the conditional probability of a cancer fatality per person-rem) and the so-called 'value of a statistical life' (VSL – dollars per lost life). The staff has stipulated that the Environmental Protection Agency cancer mortality risk coefficient is an "uncertain quantity with a true value that can be objectively determined." As a first step toward quantification of uncertainty in these analyses, the staff could quantify the uncertainty in that parameter.

NUREG/BR-0058 indicates that the analyses should quantify the associated uncertainties and it contains guidance for methods to account systematically for uncertainties in probabilistic risk assessment output metrics. One can readily combine the uncertainty in the Environmental Protection Agency conditional cancer mortality risk coefficient with those probabilistic risk assessment results to derive an uncertainty distribution for the frequency of cancer fatalities. The results of that process are consistent philosophically with the staff's conceptual construct of what uncertainties can be quantified.

If analysts follow the guidance in NUREG/BR-0058 and include the cancer mortality risk coefficient, they should develop two uncertainty distributions:

- One for the costs to implement the desired change
- One for the health benefits from the desired change

To better support the regulatory decision process, the analysts could then perform some simple calculations that illustrate the sensitivity of the decision to the selected VSL. In particular, they could answer the following questions.

- What is the VSL at which there is a break-even point between the mean values of the estimated costs and benefits?
- What is the VSL at which there is 95% confidence that the projected costs exceed the projected benefits?
- What is the VSL at which there is 95% confidence that the projected benefits exceed the projected costs?

Of course, this process does not answer the obvious questions about our confidence in that range of VSL values. However, it does provide more meaningful information to decision makers than the nominal dollars per person-rem values proposed by the staff in NUREG-1530, Revision 1. As a next step, the staff could directly address uncertainty in the VSL. The next section describes why that is appropriate.

### **Technical Correctness of the Staff Argument**

We are familiar with the reference cited by the staff – Morgan and Henrion's twenty-seven year old text that described 'value parameters' -- and reasons why the authors prefer sensitivity studies to probabilistic analysis for them. The value parameter of interest here is the 'value of a statistical life'. We are also familiar with efforts from the 1970s forward to deal with such issues and the substantial literature on the subject.

The 'value of a statistical life' research began with analysts trying to set a value on a human life. Efforts included work to determine the present value of the potential stream of income of a specific individual or an average individual, and work to determine the value of a life to society or to specific individuals. Use of such a value parameter was and always will be controversial.

An important reframing, one that is recognized in NUREG-1530, essentially changed the nature of the question of monetizing radiation exposure. Rather than trying to set a value on a statistical life, we use the parameter 'society's investment per statistical death averted', i.e., what our society is willing to pay to avert a single death. This new parameter is no longer a value parameter, but one that is knowable and can be measured, and about which clear information on the uncertainty of the parameter can be determined. In fact, many of the studies cited in NUREG-1530 have done that and provide sufficient information for development of an appropriate probability distribution. Unfortunately, the staff and many others have retained the nomenclature 'value of a statistical life' for this new measure. That leads to confusion. In our March, letter we noted: "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 would appreciate an opportunity to work with the staff to develop a methodology and rational basis for quantification of the uncertainties in these assessments.

Sincerely,

**/RA/**

Dennis C. Bley  
Chairman

## **REFERENCES**

1. U.S. Nuclear Regulatory Commission, "Proposed Revision to NUREG-1530, 'Reassessment of NRC's Dollar per Person-Rem Conversion Factor Policy'," May 1, 2017 (ML17103A462).
2. Advisory Committee on Reactor Safeguards, "Proposed Revision to NUREG-1530, 'Reassessment of NRC's Dollar per Person-Rem Conversion Factor Policy'," March 20, 2017 (ML17075A230).
3. U.S. Nuclear Regulatory Commission, NUREG/BR-0058, "U.S. Nuclear Regulatory Commission Regulatory and Cost-Benefit Analysis Guidance," Revision 5, Draft, January 26, 2017 (ML17023A180).
4. Morgan, M.G., and M. Henrion, *Uncertainty: A Guide to Dealing with Uncertainty in Quantitative Risk and Policy Analysis*, Cambridge University Press, New York, NY, 1990.

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- 2 Advisory Committee on Reactor Safeguards, "Proposed Revision to NUREG-1530, 'Reassessment of NRC's Dollar per Person-Rem Conversion Factor Policy'," March 20, 2017 (ML17075A230).
- 3 U.S. Nuclear Regulatory Commission, NUREG/BR-0058, "U.S. Nuclear Regulatory Commission Regulatory and Cost-Benefit Analysis Guidance," Revision 5, Draft, January 26, 2017 (ML17023A180).
- 4 Morgan, M.G., and M. Henrion, *Uncertainty: A Guide to Dealing with Uncertainty in Quantitative Risk and Policy Analysis*, Cambridge University Press, New York, NY, 1990.

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