NRC Response to Public Comments

NUREG-1530, Revision 1:
"REASSESSMENT OF NRC'S DOLLAR PER PERSON-REM CONVERSION FACTOR POLICY"

ADAMS Accession No. ML16147A501
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I. INTRODUCTION

This document presents the responses from the U.S. Nuclear Regulatory Commission (NRC) to written public comments received on Draft NUREG-1530, Revision 1, "Reassessment of NRC's Dollar per Person-Rem Conversion Factor Policy", in response to publication in the *Federal Register* (FR) (80 FR 53585, September 4, 2015). The updated final draft of NUREG-1530, Revision 1, was provided for Commission approval (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16147A392).

II. OVERVIEW OF COMMENTERS AND COMMENTS

The NRC staff received 11 comment submissions with a total of 38 individual comments. Table 1 presents information on the commenters who submitted comments on the draft NUREG-1530, Revision 1.

Table 1. Information on Commenters

Name	Affiliation	ADAMS Accession No.		Identifier
		Incoming	Annotated	
Jerry Kurtz	-	ML15292A335	ML16006A021	JK-1
James Slider	Nuclear Energy Institute (NEI)	ML15310A058	ML16006A020	NEI-2
Jason Schwartz	Institute for Policy Integrity	ML15323A318	ML16006A019	JS-3
Pia Jensen	-	ML15323A319	ML16006A018	PJ-4
Anonymous	-	ML15323A320	ML16006A017	AA-5
Bill Anonymous	-	ML15323A321	ML16006A016	BA-6
Dr. Goodheart	-	ML15323A323	ML16006A015	DG-7
Anonymous	-	ML15323A324	ML16006A014	A2A-8
Steven Olsen	MSME Michigan	ML15323A403	ML16006A012	SO-9
James Barstow	Exelon	ML15336A939	ML16006A011	JB-10
Dr. Edwin S. Lyman	Union of Concerned Scientists	ML16020A335	ML16035A391	EL-11

Similar comments were grouped, as appropriate, to facilitate providing NRC responses.

Comments were binned into the following categories:

a. Comments Related to the Cancer Mortality Risk Coefficient
b. Comments Related to the Dollar per Person-Rem Conversion Factor
c. Comments Related to the Methodology
d. Comments Related to the Dose and Dose-Rate Effectiveness Factor (DDREF)
e. Comments Related to the Value of Statistical Life (VSL)
f. Other Comments

a. *Comments Related to the Cancer Mortality Risk Coefficient*

Comment a1 (combined NEI, JB, and JS): Page 22, lines 23 and 28, Section 5, Nominal Risk Coefficient RE: [line 23] "Thus, by not accounting for cancer morbidity, the NRC may underestimate the benefits of a proposed action (e.g., medical costs averted, value of lost production, etc.) by as much as another 20 percent." [line 28] "The NRC staff prefers to achieve greater alignment with ICRP Publication 103 and adopt the nominal risk coefficient of 5.7×10^{-4} per rem with the understanding this coefficient may underestimate the U.S. population risk by as much as 30 percent."

The significance of the potential overestimation of benefits or underestimation of risk and the net effect of these potential uncertainties is not explained. It should be. [NEI-2-1, JB-10-1]

Page 22, lines 32-33, Section 5, Nominal Risk Coefficient RE: "However, the final dollar per person-rem calculated using either the EPA or ICRP is not practically different."

The statement that there is not a practical difference between the use of the ICRP risk coefficient and the EPA value is not supported by evidence. In the interest of full disclosure, the staff should consider providing some indication of the sensitivity of the final figure to this difference. For example, if the EPA values were used, the best estimate value would be more similar to the high estimate, and the low and high estimates similarly increased. [NEI-2-2, JB-10-1]

NRC should reconsider its choice of risk coefficient to better account for morbidity effects.

The NRC proposes to adopt the ICRP 2007 estimate of the risk of health effects from radiological exposure. The ICRP's risk coefficient translates nonfatal cancers and heredity effects into loss-of-life measures "based on a perceived relationship between quality of life and loss of life. In this way, the value of a statistical life is applicable across all contributors to the total health risk coefficient." NRC should explain more thoroughly how morbidity effects are translated into mortality effects, because this translation is potentially problematic. This translation sounds related or analogous to the methodology for valuing quality-adjusted life-years. The QALY [quality adjusted life-year] method is problematic for several reasons, as discussed in Richard Revesz and Michael Livermore's 2008 book *Retaking Rationality*. Importantly, there is a risk of over-counting the costs of certain types of morbidity effects because there is a false assumption that people will not adapt to their altered health states. At the same time, it is not clear whether ICRP's risk coefficient captures all the morbidity effects of fatal and nonfatal cancers, including the dread experienced by people with slow-developing cancers.

Curiously, ICRP's risk coefficient (5.7×10^{-4} per rem), which is meant to include nonfatal and heredity effect, is lower than the EPA's 2011 mortality-only risk coefficient (5.8×10^{-4} per rem). NRC dismisses the EPA number and selects the ICRP figure with little discussion. Though harmonization with international bodies is an admirable goal, so is harmonization with other U.S. federal agencies. NRC seems concerned that using EPA's mortality-only figure could cause NRC to underestimate the benefits of a proposed action by as much as 20 percent, but NRC admits that the ICRP figure it selects "may underestimate the U.S. population risk by as much as 30%." NRC should explain why it believes that ICRP's risk coefficient is preferable.

The NRC claims that the choice between EPA's figures and ICRP's would result in "not practically different" benefit valuations, but the math does not support that claim. For example, adding the U.S. National Academies estimate of genetic effects (0.4 x 10^{-4} per rem) to EPA's mortality-only risk coefficient, and then adjusting the sum up by an additional 20% to account for morbidity effects, results in a morbidity/heredity-adjusted EPA-based risk coefficient of 7.44 x 10^{-4} per rem. If then multiplied by the $9 million VSL estimate, the central conversion factor would be $6,696, which is significantly higher than NRC's estimate of $5,100.

Alternatively, NRC could apply the EPA-adjusted risk coefficient for sensitivity analysis. Multiplying a 7.44 x 10^{-4} per rem risk coefficient by the high VSL derived above of $10.9 million would yield a high conversion factor of $8,110, which is significantly higher than NRC's high conversion factor of $7,500 (multiplying this high risk coefficient by NRC's proposed high VSL of $13.2 million would yield an even higher conversion factor of $9,821). NRC says it is not adopting low and high risk coefficient factors for sensitivity analysis "for simplicity," but as this simple math demonstrates, multiplying a high VSL by a high risk coefficient to derive a high conversion factor for use in sensitivity analysis is no more complex than using a single risk coefficient for all calculations.

Whether selecting the EPA figure or the ICRP figure, NRC's plans to update the coefficient as new recommendations are published is appropriate. [JS-3-3]

Page 23, lines 2-3, Section 5, Nominal Risk Coefficient RE: "For simplicity, the NRC staff does not recommend low and high nominal risk coefficient factors for use in sensitivity analyses."

Simplicity alone is insufficient justification for not including the range of risk coefficient factors in sensitivity analyses. If the NRC has a stronger justification, it should be provided. Otherwise, the NRC should reexamine the proposed high and low values of the dollar per person-rem conversion factor to ensure they adequately bound uncertainties in the nominal risk coefficient. [NEI-2-3, JB-10-1]

NRC Response: The NRC agrees with this comment that the use of the International Commission on Radiological Protection (ICRP) nominal risk coefficient has produced confusion. The ICRP value includes a global average risk of fatal cancers, non-fatal cancers, and severe heritable effects. However, on the VSL portion of the calculation, only mortality is monetized. Therefore, to reduce confusion and to increase coherence between the risk coefficient and VSL, the staff has decided to use the U.S. Environmental Protection Agency (EPA) cancer mortality risk coefficient of 5.8 × 10^{-4} per rem to better align with the monetized mortality value of the VSL. Additionally, the EPA cancer mortality risk value is specific to a U.S. population and not averaged over a larger portion of the world population. The use of the EPA cancer mortality risk coefficient instead of the ICRP detriment coefficient results in a comparable dollar per person-rem conversion factor. Selecting the EPA cancer mortality risk coefficient also strengthens the basis for the risk coefficient value and is consistent with what is being monetized in the VSL value.

In regard to the uncertainty of the EPA point estimate value of 5.8 x 10^{-4} per rem, the EPA reports a 90 percent confidence interval around the estimate of 2.8 x 10^{-4} to 1 x 10^{-3}. The point estimate and confidence intervals around the estimates will be added to NUREG-1530, Revision 1.

The NRC disagrees with the comments regarding the potentially significant difference in results between using the ICRP total detriment coefficient and the EPA cancer mortality risk coefficient. As discussed in NUREG-1530, Revision 1, Section 5, the use of the EPA cancer mortality risk coefficient results in a dollar per person-rem conversion factor that is approximately the same as that calculated with the ICRP total detriment coefficient.

b. Comments Related to the Dollar Per Person-Rem Conversion Factor

Comment b1 (combined NEI and JB): Page 25, line 28, Section 6: "The NRC acknowledges that there may be unique circumstances where other dollar conversion factors may warrant consideration."

This sentence could be interpreted to mean that NRC will choose whatever value of dollar per person-rem it wishes in any particular case. The paragraph is not clear on how the analyst should select other values based on "unique circumstances". The document should provide additional guidance to ensure the consideration of unique circumstances does not become an excuse for using arbitrary values. If the NRC uses a different value of the dollar per person-rem conversion factor in a specific application, the staff should clearly document the basis for the use of that different value. [NEI-2-4, JB-10-1]

Page 25, lines 28-38, Section 6: "The NRC acknowledges that there may be unique circumstances where other dollar conversion factors may warrant consideration. For example, doses to a population whose age distribution is not representative of the general population could be subject to a different risk coefficient because health risks are directly related to the age distribution of the affected population. Further, recognizing the uncertainties inherent in establishing a representative conversion factor, alternative values to capture the uncertainties may be warranted. Thus, it would be reasonable to expect an analyst to include alternative valuations in regulatory analyses in order to show the decision maker the sensitivities of the proposed action to relevant considerations. However, the base case computations in a regulatory analysis will use the recommended best estimate dollar conversion factor of $5,100 per person-rem, and apply the low and high estimates in illustrating sensitivity and in bounding the range and direction of the impacts."

By suggesting that alternative risk coefficients might be important to consider, this section again begs the question about including alternate risk coefficients in the sensitivity analysis. [NEI-2-5, JB-10-1]

NRC Response: The NRC agrees with the comments that clearly documenting the basis for the use of other dollar per person-rem conversion factors is necessary. The NRC will clarify in Section 6, NUREG-1530, Revision 1, that the basis for any other dollar per person-rem conversion factor should be documented.

Comment b2: Should allow for specific licensee amendment of specified values for other tangible costs such as loss of experience of dosed out worker, training costs associated with replacement workers, etc. In other words, they cannot go below these guidelines but can go above factoring other costs. Here at our DOE project, we use $11,000/Person-Rem as our number because of those other costs. [JK-1-1]

NRC Response: The NRC considers this comment to be outside the scope of NUREG-1530, Revision 1. Other costs such as those mentioned in the comment are treated explicitly in calculating incremental labor costs for implementing (e.g., planning and performing the activity, training costs) and therefore should not be used to arbitrarily increase this conversion factor. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment b3: NRC should incorporate its new conversion factors into any retrospective reviews.

The commenter indicated that the NRC is not proposing that previous decisions be reviewed or updated based on this revised conversion factor policy. Further, the commenter stated that the NRC gives several reasons, including the assumption that the same factors that justify an increase in the dollar per person-rem conversion factor have had a similar effect on the cost of modifying a licensed facility, and that therefore, updated cost-benefit analysis results would most likely result in little, if any, change to past regulatory decisions. This assumption may not necessarily hold true. For example, technological innovation and increased productivity could simultaneously lead to income growth resulting in higher willingness to pay for the value of a statistical life, while also decreasing compliance costs.

The NRC should incorporate its new conversion factors into any retrospective reviews of existing regulations. The NRC has developed a retrospective review plan pursuant to EO 13579. That EO called for independent agencies to follow the principles of EO 13563, which requires executive branch agencies to "use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible." Consistent with these principles, NRC should recalculate the benefits of rules undergoing retrospective review by using the "best available techniques" – namely, the updated conversion factors. Incorporating the new conversion factors should be a simple mathematical calculation requiring very little work from agency staff, and the results might point out the need for more stringent regulation. Even if the new factors would not change the regulatory outcome, regulatory analysis is conducted to promote public transparency as well as to aid decision making, and an updated evaluation of the health benefits would help the public better understand the importance of NRC's existing regulations. [JS-3-4]

NRC Response: The NRC agrees with this comment that the updated dollar per person-rem conversion factor should be used in future retrospective reviews. The NRC uses the guidance in NUREG-1530, Revision 1, when conducting a cost-benefit analysis of a new policy or regulation that may affect public health or safety. The cost-benefit analysis compares the total willingness to pay for the averted health risk reductions from these policies to the additional costs that will be incurred if the policies are adopted. Consistent with the quoted statement from Executive Order (EO) 13563, the NRC would apply the NUREG-1530, Revision 1, conversion factor in evaluating regulations currently being considered and those to be considered in the future.

For retrospective reviews, EO 13563 instructs agencies to periodically review "existing significant regulations to determine whether any such regulations should be modified, streamlined, expanded, or repealed so as to make the agency's regulatory program more effective or less burdensome in achieving the regulatory objectives." The NRC would use the guidance in NUREG-1530, Revision 1, to perform these retrospective reviews. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment b4: Even the IMF [International Monetary Fund] considers medical costs from radioactive pollution an unfair subsidy to the energy sector, which should be factored in, and they have pointed this out repeatedly. Ignoring the cost of healthcare is wrong.

Why isn't the medical cost of radioactive pollution factored into the equation?

The NRC allows the nuclear utilities-industry to externalize the true cost upon society. Cancer is not simply an individual problem, but has heavy social and economic costs to society as a whole –individuals and taxpayers. And, cancer is not the only costly radiation induced health problem. [JS-3-5]

NRC Response: The NRC considers this comment to be outside the scope of NUREG-1530, Revision 1. The other factors mentioned in the comment are addressed externally to the dollar per person-rem factor and are captured in a different element of the cost-benefit analysis. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment b5: Human capital is ignored: NRC makes VSL of older, educated, experienced people less, because they are more likely to get cancer due to age. [JS-3-6]

NRC Response: The NRC disagrees with this comment. The EPA VSL value reflects the U.S. population based on decennial census figures and is based on small, incremental changes in risk. It is not a value assigned to an individual life. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment b6 (combined DG, A2A, and SO): According to BEIR [Biological Effects of Ionizing Radiation] VII, for those who die, the life-shortening effects are on the order of 14 to 15 years. Currently the average monthly cost of new cancer medications, according to Memorial Sloane-Kettering, is around $10,000 per month (median), which is $120,000 per year, and thus $1.8 million for 15 years, if the prices don't rise, but the prices have been rising and rapidly so. This is cost of medication alone, and excludes the cost of doctors, hospitals, and social or financial cost of caregivers for the ill, and loss of "free" caregivers for children and the elderly, by loss of those who are middle aged, through illness and/or death. In short, it excludes value of work done, whether paid or unpaid. Women are disproportionately impacted by radiation induced cancers, as well, and women as a whole do much of the unpaid work, which allows continuing functioning of a household, and without which there may need a maid. Already the high cancer drug prices are being decried, even by some with ties to big pharma, it's so bad. Life-boat ethics is kicking in. For instance, some cancer drugs are unavailable in the UK Public Health System due to high price and cost-cutting (even while they, like the U.S., find money to subsidize the mostly foreign nuclear industry). Even where people have private insurance, there are limitations in coverage; bankruptcy may have to be declared, and the taxpayer most likely picks up cost (or the person doesn't get the needed care).

Where is the value of paid and unpaid labor? Loss of middle-aged people means someone must pay for caregiving of children and elderly, as well as for the middle-aged with cancer. Women are more likely to get cancer and be caregivers. Who pays?

This is also discriminatory and probably illegal. It means that nuclear reactors near middle aged and senior citizens will not be as likely to upgrade to protect against nuclear accident. If the utility does not plan to evacuate elderly-disabled people, this violates the ADA and probably the

Civil Rights Act. On p. 25 NRC says: “doses to a population whose age distribution is not representative of the general population could be subject to a different risk coefficient because health risks are directly related to the age distribution of the affected population.” Does the “N” in NRC stand for Nazi? They exterminated the disabled to save money. Those involved were tried for “Crimes against humanity.” However, that was arguably more humane than the radiation poisoning, cancer, blindness, etc. which the NRC proposes for the elderly and disabled.

Your use of cost-benefit is fraudulent because costs and benefits accrue to different groups. It is public health vs. utility/corporate profit. Your use of “willingness to pay” is fraudulent for the same reasons. Clearly, you did not ask people if utilities should pay, but if they would pay. You didn’t give a death free renewables option either.

Americans increasingly turn to high cost fertility treatment in order to have children. But, the ICRP considers the first 2 weeks of baby lives expendable. Yet, those getting fertility treatment are not notified of this, and even mortgage their homes for repeated attempts to have a baby. This is not factored in. But how to quantify extermination of one’s genes anyway?

Stochastic is incorrectly defined in your document. Stochastic refers to the randomness of radiation damage, which can lead to long-term health impacts. Because damage is random, increased exposure increases risk. The more bullets shot at you, the more likely you are to be fatally shot.

Contrary to what NRC says, VSL is about the value of real people’s lives. Just like in mass shootings, it is real people who are killed. Statistics are the odds of being killed. The more you allow the nuclear industry to pollute, the more real people will be killed. [DG-7-1, A2A-8-2, SO-9-5]

NRC Response: The NRC disagrees with this comment regarding the value assignment per life and that stochastic is incorrectly used in NUREG-1530. The EPA VSL value reflects the U.S. population based on decennial census figures and is based on small, incremental changes in risk. It is not a value assignment per life. After considering this comment, the NRC staff clarified the definition of “stochastic health effects” in NUREG-1530, Revision 1. The remaining points in this comment are outside the scope of NUREG-1530, Revision 1.

Comment b7 (combined DG and SO): Why not use real numbers, instead of made up ICRP numbers?

Just before BEIR VII was completed in 2005, a 15 country study of nuclear workers was published, which showed that the cancer risks were much higher than stated in the BEIR report, In an Appendix, BEIR VII says that they did not have time to take it into consideration. Additionally, there is a very recent 3 country INWORKS study of nuclear workers, which suggests that excess cancer rates from ionizing radiation are around 10 times higher than concluded by the BEIR report. Frighteningly, this appears a middle of the road number, which sits between BEIR VII and the 15 country INWORKS study. Using the ICRP model instead of taxpayer funded BEIR VII is just a way to lowball the cost. The ICRP model is flawed. [DG-7-2, SO-9-3]

NRC Response: The NRC agrees that the use of the ICRP nominal risk coefficient has produced confusion. See NRC response to comment a1. Comments regarding the validity of the ICRP values are outside the scope of NUREG-1530, Revision 1, because the NRC has adopted the EPA cancer mortality risk coefficient values.

Comment b8: $5,100 per person rem conversion factor is not updating VSL to $9 million, but to $5.1 million if you use excess cancer risk (morbidity) rather than only death (mortality), and use U.S. government funded BEIR VII (2005). Using U.S. government funded INWORKS, excess cancer rates are 10 times higher than BEIR. INWORKS give excess cancer deaths at 51-58% per Sv. Excess cancer cases are roughly double (52% of those with cancer die). Thus, 99 to 100% excess cancers per Sv. BEIR VII excess cancer risk (morbidity) is 0.001 per person rem (10mSv). This excludes other diseases, such as cataracts, and inherited defects. INWORKS excess cancer risk (morbidity) is approximately 0.01 per person rem, so VSL is $510,000 or less, using NRC proposed [dollar] per person rem conversion factor of $5,100. The $ per person rem conversion factor must be $90,000 (INWORKS) to really be $9 million; $9,000 for BEIR.

The current $1,000 conversion factor puts VSL at $100,000 (INWORKS) or $1,000,000 (BEIR VII). [A2A-8-1]

NRC Response: The NRC disagrees with this comment, which concerns VSL calculations, discounting, and the cost of cancer treatment. As a policy, the NRC does not use morbidity directly in the manner described by the commenter. BEIR VII is used by the EPA in its current VSL and risk coefficient calculations, and NUREG-1530, Revision 1, leverages those EPA values. The NRC disagrees that the ICRP model is flawed and that the NRC should use the 2015 INWORKS study alone. BEIR VII and ICRP use a conglomeration of studies and then take into account specific background radiation exposure data applicable to the U.S., whereas the INWORKS studies mentioned in the comment are individual studies and are, or will become, part of the aggregate studies considered in the future. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment b9: A “recommendation” of NRC claims to use $2,000 person rem conversion factor. However, NRC discounts this $2,000 backwards from the theoretical date of an accident, with a 7% discount rate (NUREG/BR-0184). In 25 years, e.g. in NUREG/BR-0184, pp. B-3-4, the $2,000 reduces to $368! This reduces VSL to $36,800 (INWORKS) or $368,000 (BEIR VII). Meanwhile NRC pretends VSL is $3 million. [A2A-8-1]

NRC Response: The NRC disagrees with this comment based on a misinterpretation of discount factor usage. The discount factor does not “reduce” any cost amount or benefit that occurs in the future. The future cost remains the same, and in the event of an insurance payout or settlement, or other remuneration, the cost in the future is not reduced by the discount factor. The purpose of the discount factor is to determine how a future cost of a certain amount economically affects the industry at a particular, nearer time, thought of as the “present” time (in the term “Net Present Value”). If a certain cost will be incurred 25 years in the future, because of inflation and investments and other economic realities, the effect “now,” or at the “present time,” will not be as high as the full future value, which will be undiminished should the future cost be incurred. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment b10 (combined A2A and SO): Cost of life-extending cancer drugs is $120,000 to $207,000 per additional year of life and is increasing at 10% per year even adjusting for inflation. 14 to 15 years is the average life-shortening effects of the radiation induced cancer (BEIR).

Thus, $9 million will not pay even for 14 to 15 years of cancer drugs in the future. There are other medical costs. Who pays? [A2A-8-1, SO-9-1]

NRC Response: The NRC considers this comment to be outside the scope of NUREG-1530, Revision 1, as the cost of illness is estimated in a different element of the cost-benefit analysis. As to the final point that the VSL is not enough to cover specific cancer drugs for the mentioned "average life-shortening effects of the radiation induced cancer," this is not the intent of the VSL. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment b11 (combined DG and SO): Why is there a backwards discount, which does not make any sense?

It is disingenuous at best to use a discount rate to discount the current value of life from a future value, absurdly created by an accident of unknown date that "you can't prove." We don't know inflation going forward, but with no end in sight to money printing, regardless of jawboning to give confidence in holding T-bills, but we can easily assume that the value of U.S. dollars will continue to go down as we overspend on the government budget. This is exactly the same as printing, therefore the cost of a future cancer should not be discounted backwards, but should be inflated forwards. Even if we accepted the "discount backwards" model, using a rate of 7% is absurd, when is the last time you thought you could get a 7% return on any investment? [DG-7-3, SO-9-2]

NRC Response: The NRC considers this comment to be outside the scope of NUREG-1530, Revision 1, which does not provide guidance on discounting or on choosing a discount rate. In addition, the NRC disagrees with this comment because discounting is used to render costs and benefits that occur in different time periods comparable by expressing their values in present terms. In practice, it is accomplished by multiplying the changes in future consumption by a discount factor. At a summary level, discounting reflects that people prefer consumption today to future consumption, and that invested capital is productive and provides greater consumption in the future. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment b12: The proposed approach the NRC staff uses to choose an updated value of a statistical life appears generally reasonable. The best estimate value of $9 million in 2014 dollars, as well as the low and high estimates for use in sensitivity analyses, was chosen to be consistent with the current VSL values used by other agencies.

However, UCS [Union of Concerned Scientists] has concerns about the NRC staff's choice of radiation risk coefficient, which is the other parameter that is used to derive the conversion factor. The underlying risk coefficient of 5.7×10^{-4} per rem, chosen to be consistent with ICRP publication 103, is supposed to represent the weighted risk associated with both fatal and nonfatal cancers, as well as heritable effects. However, the parameter is smaller than the risk coefficient for cancer mortality alone recommended by the National Academy of Sciences' BEIR VII committee, which is approximately 5.8×10^{-4} per rem, and well below the BEIR VII

recommendation for cancer incidence, 1.16×10^{-3} per rem. Moreover, the coefficient does not take into account the risks associated with other diseases now understood to be associated with ionizing radiation exposure, such as cardiovascular disease. NUREG-1530 Rev. 1 itself concedes that its choice of risk coefficient "may underestimate the U.S. population risk by as much as 30 percent," but does not explain why that is acceptable.

Consequently, UCS believes that the best estimate parameter for exposure to low-dose and low-dose-rate low-linear-energy-transfer (LET) radiation of $5,100 per person-rem (2014 dollars) is not clearly justified and is likely too low.

UCS also strongly endorses the adjustment of the conversion factor to take into account high dose and high dose rate scenarios, as well as exposure to high-LET radiation, where appropriate, as outlines in Appendix B of NUREG-1530, Rev. 1. NRC currently does not take these important considerations into account in its regulatory analyses. In fact, the MACCS [MELCOR Accident Consequence Code System] code used in the NRC analyses does not compute separate population dose values for those exposures where a DDREF should not be used. Thus, these analyses generally underestimate the magnitude of cancer induction associated with a given population exposure. [EL-11-3]

NRC Response: The NRC agrees with this comment that the use of the ICRP nominal risk coefficient has produced confusion. See NRC response to comment a1.

The NRC disagrees in part with this comment. Although the MACCS code does not calculate and report separate population dose values for groups of individuals who may be exposed to ionizing radiation at higher doses or dose rates, the NRC disagrees that this will necessarily result in underestimating the magnitude of cancer induction associated with a given population exposure.

The MACCS cancer risk model uses the following piecewise linear cancer risk function to calculate the risk of cancer induction in a specified target organ as a function of radiological dose:

$$R(D) = \alpha \cdot \frac{D}{DDREFA} \qquad D < DDTHRE$$
$$R(D) = \alpha \cdot D \qquad D \geq DDTHRE$$

where:

R(D)	=	risk of cancer induction in a specified target organ for dose D
D	=	50-year lifetime dose commitment to the specified target organ
α	=	cancer risk coefficient
DDREFA	=	analyst-specified dose-dependent reduction factor
DDTHRE	=	analyst-specified dose threshold level

Within MACCS, the analyst specifies the value of the DDREFA parameter for each type of latent cancer effect and target organ. This parameter represents the dose-dependent reduction factor that is used to reduce the organ-specific cancer risk by a specified value, if certain conditions are met. In particular, if the organ-specific 50-year lifetime dose commitment incurred by a representative individual within each spatial element during the early (emergency) phase

exposure period is less than the analyst-specified dose threshold level represented by the DDTHRE parameter, the risk of cancer induction in that target organ from exposure to ionizing radiation is reduced by a factor of DDREFA. For the intermediate and late (recovery) phase exposure periods—which typically represent the periods after an accident has been brought under control and there are no more radiological releases to the atmosphere—MACCS assumes that all organ-specific 50-year lifetime dose commitments will be less than DDTHRE, and therefore applies the DDREFA parameter to reduce the organ-specific cancer risk. The NRC acknowledges that it is theoretically possible for an organ-specific 50-year lifetime dose commitment to exceed the dose threshold level represented by the DDTHRE parameter during the intermediate or late phases. However, the NRC disagrees that assumptions underlying the MACCS cancer risk model necessarily (or generally) result in underestimating the magnitude of cancer induction associated with a given population exposure. Moreover, even if the organ-specific risk of cancer induction were underestimated, this would not affect the calculation of population dose that provides input to the calculation of benefits for each alternative evaluated as part of a regulatory analysis.

Finally, as stated in Appendix B of the draft report, NRC staff will incorporate specific guidance on how and when to use the dose and DDREF in the cost-benefit analyses in other elements of the cost-benefit guidance update process discussed in SECY-14-0002, "Plan for Updating the U.S. Nuclear Regulatory Commission's Cost-Benefit Guidance."

c. Comments Related to the Methodology

Comment c1: UCS does not support the use of regulatory cost-benefit analysis based on overly narrow definitions of costs and benefits and reductionist formulas to monetize the public health benefits of regulations. The federal government should undertake a comprehensive reform of these practices. However, as long as the NRC and other federal agencies continue to rely on such analyses, it is imperative that the methodology they use is rigorous and is based on technically sound quantitative data. [EL-11-2]

NRC Response: The NRC partially agrees with the comment and believes that the use of the dollar per person-rem conversion factor in NRC's cost-benefit methodology is rigorous and is based on technically sound quantitative data.

The NRC disagrees with the comment that the NRC's cost-benefit analysis is "overly narrow" and "reductionist" and that these practices need a comprehensive reform. Additionally, this comment is outside the scope of NUREG-1530, Revision 1. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment c2 (combined NEI and JB): Page 28, lines 5-7, Section 7.2: "The NRC staff should periodically update the nominal risk coefficient used in the dollar per person-rem conversion factor when the ICRP provides new recommendations for its conversion factor."

The text sounds as if the staff's intent is to require an update be timely made following receipt of a new ICRP recommendation for the value of nominal risk coefficient.

Certainly, the NRC staff should stay informed of changes in ICRP recommendations. It may also make sense for the NRC to consider evaluating the effect of a new ICRP recommendation on the NRC's dollar per person-rem calculation. However, it does not follow

that the NRC necessarily must adopt the latest ICRP recommendation as its own within a specific timeframe, or revise the NRC's dollar per person-rem value every time the ICRP value changes. The critical question is what effect the ICRP change has on public health and safety. Slavish congruence with international recommendations that yields little or no benefit to public health and safety is no virtue, particularly if achieving it would require the allocation of NRC and industry resources that could be used to greater benefit in other areas. [NEI-2-7, JB-10-1]

NRC Response: The NRC agrees that periodic reviews of the scientific literature should be performed. The NRC staff has revised Section 7.2, NUREG-1530, Revision 1, to clarify how the NRC should consider revisions to the cancer mortality risk coefficient.

Comment c3 (combined NEI and JB): Page 28, lines 5-7, Section 7.2: "The NRC staff should periodically update the nominal risk coefficient used in the dollar per person-rem conversion factor when the ICRP provides new recommendations for its conversion factor."

The text is unclear whether the NRC will seek public involvement in future updates to the nominal risk coefficient used in the dollar per per-rem conversion factor. We strongly urge the NRC to solicit public input if and when future updates are considered. The draft NUREG-1530, Rev. 1 and whatever NRC administrative procedures are used to implement this requirement should be revised to reflect this imperative. [NEI-2-8, JB-10-1]

NRC Response: The NRC agrees with this comment and will continue to solicit public input in future updates to NUREG-1530 using established processes.

Comment c4 (combined NEI and JB): Page 28, lines 14-16, Section 7.3: "Therefore, the NRC staff should reevaluate its baseline values for VSL (to account for structural changes in the economy) and nominal risk coefficient approximately every five years, and update guidance and regulations as needed."

It is not clear what "structural changes in the economy" the staff thinks might affect VSL and, more specifically, what structural changes are relevant to nuclear safety regulations. If there are specific economic factors in the basis for VSL that the NRC believes it needs to reevaluate every five years, those factors and the criteria on which the NRC will reevaluate them ought to be stated clearly in NUREG-1530. At the same time, if those factors are so dynamic and have such a profound effect on VSL, the NRC should consider choosing a different value for VSL or determining a different basis for updating its chosen value of VSL that is less influenced by factors so dynamic that they are likely to change significantly within the proposed reevaluation period. [NEI-2-9, JB-10-1]

The document offers no evidence to support the recommendation to reevaluate the baseline value for VSL and the nominal risk coefficient every five years. For example, the document does not mention how many of the NRC's past regulatory analyses would reach different conclusions if the dollar per person-rem conversion factor changed by as much as NRC expects the factor to change in its proposed five-year updates. The document is silent on how such a requirement would be captured in the NRC's administrative controls. The document is silent on the impacts the reevaluation would impose on NRC and industry resources, and on the potential benefits to public health and safety the NRC expects to accrue from reevaluating the conversion factor on the proposed five-year interval. [NEI-2-10, JB-10-1]

Updating guidance and regulations after every five-year reevaluation of the conversion factor could be enormously burdensome to NRC and the entities subject to NRC regulations. In addition, such updates of guidance and regulations could take years due to public notice and comment requirements. Given the resources, stakes, and timescales involved, it would be imprudent to undertake an update of guidance and regulations on the proposed five-year frequency of reevaluating the dollar per person-rem conversion factor. With the nuclear industry's long planning horizons, cementing into place an additional factor to drive change in guidance and regulations as often as every five years would add even greater uncertainty to the regulatory environment. We recommend that any reevaluation be triggered by the magnitude of the change in the conversion factor, rather than the passage of time or the publication of a new ICRP recommendation. As the staff itself mentions on page 29, lines 13-15, current experience indicates "…increases of at least an order of magnitude would be necessary to justify any reassessment of [past] decisions." [NEI-2-11, JB-10-1]

NRC Response: The NRC agrees with the comments and the recommendation provided. NUREG-1530, Revision 1, has been revised to remove the reference to structural changes and the five-year periodicity.

d. *Comments Related to Dose and DDREF*

Comment d1 (combined NEI and JB): Page B-1, line 27, Appendix B: "Organizations such as the National Academies' Biological Effects of Ionizing Radiation Committee VII and the U.S. Environmental Protection Agency (EPA) also developed risk coefficients that use a different judged DDREF of 1.5 in their derivations (NAS, 2006 and EPA, 2011b). Thus any high dose-dose rate corrections to a coefficient should be based on the DDREF developed by that particular organization."

It would be appropriate to insert before the last sentence an acknowledgment of the continued uncertainty about the shape of the dose response curve and the value of DDREF. We suggest something like the following: "It should be noted that considerable debate continues regarding the shape of the dose-risk response curve for low doses, and thus the value of a DDREF to be applied." [NEI-2-14, JB-10-1]

NRC Response: The NRC acknowledges that there is debate regarding the shape of the dose response curve at low doses. The NRC agrees with the comment and has adopted the EPA cancer mortality risk coefficient (DDREF value of 1.5) in NUREG-1530, Revision 1, which is consistent with the National Academy of Sciences recommendation.

Comment d2 (combined NEI and JB): Appendix B does not mention guidance contained in ICRP Publication 103 about aggregation and uncertainty in estimating population radiation exposures. Paragraph 221 of ICRP 103 cautions: "When exposures occur over large populations, large geographical areas, or long time periods, the total collective effective dose is not a useful tool for making decisions because it may aggregate information inappropriately and could be misleading for selecting protective actions. To overcome the limitations associated with collective effective dose, each relevant exposure situation must be carefully analyzed to identify the individual characteristics and exposure parameters that best describe the exposure distributions among the concerned population for the particular circumstance. Such an analysis – by asking when, where and by whom

exposures are received – results in the identification of various population groups with homogeneous characteristics for which collective effective doses can be calculated within the optimization process…In practical optimization assessments, collective doses may often be truncated…" This means that the determination of offsite radiation exposures in a regulatory analysis should reflect the identification of appropriate population groups for which collective effective doses can be calculated and, depending on uncertainty and other characteristics, truncated. This does not appear to be addressed in the revision of NUREG-1530. [NEI-2-15, JB-10-1]

NRC Response: The NRC is aware of this guidance and the concern of the misuse of collective dose, especially when over-aggregating small doses and calculating a total population latent cancer fatality number from an activity. As part of its regulatory analysis, the NRC staff performs area-specific analyses that do contain the potential to over-aggregate small doses. Also, when conducting its regulatory analysis, the NRC staff does not calculate a total population mortality number, but instead compares the incremental reduction in risk to the cost of some action. These incremental reductions in risk can be used in comparing various regulatory options and associated costs. Additionally, this comment is outside the scope of NUREG-1530, Revision 1. After considering this comment, no change was made to NUREG-1530, Revision 1.

e. *Comments Related to the VSL*

Comment e1: Harmonizing the VSL with other federal agency estimates is appropriate, but NRC should not give weight to the range described without endorsement by OMB in its 2003 Circular A-4 Guidance.

NRC calculates its central or "best" estimate of the VSL ($9 million) by taking the simple mean of the EPA's VSL ($8.7 million) and DOT's VSL ($9.3 million). Relying on the expertise of these two agencies in estimating the VSL is appropriate, and not only because it saves NRC the cost of duplicating their sophisticated efforts. Harmonizing regulatory analysis across federal agencies is valuable in itself, increasing the rationality and transparency of regulatory analysis. Any significant disparity between agencies' VSLs, without justification, suggests that some agencies may be under- or over-regulating and makes it difficult to compare the value of life-saving regulations across agencies. NRC should consider coordinating more explicitly and continually with EPA, DOT, and other agencies, and could even call for an interagency working group on VSL estimates.

NRC calculates its low and high estimates of the VSL by taking the median of the low and high values reported by three sources: DOT, DHS, and OMB. There are at least three issues with this methodology. First, NRC claims that OMB "endorsed" in its 2003 Circular A-4 a range of VSL estimates from $1 million to $10 million. In fact, the Circular A-4 does not explicitly recommend agencies use numbers in that range. In a paragraph discussing the "considerable body of academic literature" on the VSL, OMB merely reports – descriptively, not prescriptively – that "a substantial majority of the resulting estimates of VSL (from the literature) vary from roughly $1 million to $10 million per statistical life." Far short of "endorsing" or "selecting" this range, OMB cautions that "the literature-based VSL estimates may not be entirely appropriate for the risk being evaluated." The $1 million estimate, for example, may simply have been an outlier from the literature and not a value OMB was recommending for agency use. As NRC notes, on occasions when OMB has used the VSL itself, it has used a

much higher number ($6.7 million), and in OMB's 2011 Primer on Circular A-4, OMB instead discussed a range of $5 million to $9 million as representing current agency practices. Moreover, the literature OMB cites in Circular A-4 – principally the work of Viscusi and Aldy – has been relied upon more specifically and carefully in other agencies' estimates of the VSL. At best, by including the OMB range in its estimates along with other agencies' work, NRC may be double counting the literature, at worst, NRC may be giving weight to outlying, outdated data points.

Second, NRC does not explain why it is taking the median value for its low and high estimates, while it took the simple mean for its "best" estimate. Third, after choosing EPA's estimates as an input into its calculation of the "best" VSL, NRC excludes EPA from the calculation of low and high estimates, presumably because EPA uses only a single VSL estimate ($8.7 million) instead if a range with lows and highs. However, an alternate way to look at EPA's analysis is to conclude that $8.7 million is both EPA's low and high estimate, as well as its best estimate. Taking the simple mean of the low and high estimates from DOT, DHS, and EPA – and excluding OMB's non-prescriptive reference to the literature – would give a low estimate of $6.9 million (as opposed to the $5.3 million figure NRC calculated) and a high estimate of $10.9 million (as opposed to $13.2 million). [JS-3-1]

NRC Response: The NRC agrees with this comment that relying on the expertise of the EPA and DOT estimates of VSL is a best practice for the reasons given, and agrees that the NRC should not give weight to the OMB reported values. NUREG-1530, Revision 1, uses the DOT low and high VSL values provided in Table 1 of the revised NUREG, which envelop the DHS values. The wording in NUREG-1530, Revision 1, has also been revised to clarify that OMB Circular A-4 reported VSL estimates between $1 million and $10 million per statistical life.

The NRC disagrees with the portion of the comment that $8.7 million is EPA's low, best, and high estimate for its VSL estimate. As explained in EPA's Guidelines for Preparing Economic Analyses, updated May 2014, Table B.1 of that document contains the VSL estimates that form the basis of the EPA's recommended central VSL estimate. Fitting a Weibull distribution to these estimates yields a central estimate (mean) of $7.4 million (in 2006 dollars) with a standard deviation of $4.7 million. After considering this part of the comment, no change was made to NUREG-1530, Revision 1.

Comment e2: The formula to adjust VSL for inflation and growth is appropriate, but NRC should more explicitly coordinate its updates with any VSL updates from EPA, DOT, or DHS.

Prospectively adopting a system to allow for automatic updates to the VSL to account for inflation and growth is a positive step that should help NRC avoid the problem of being stuck for years with an outdated valuation. NRC's plan to review conversion factors every five years is also prudent. However, because NRC is relying on EPA, DOT, and DHS for its estimates, NRC should further provide for updates in coordination with any subsequent work by those three agencies on their VSL estimates—just as NRC proposes to update its risk coefficient as ICRP does so. Harmonizing regulatory analysis across federal agencies is valuable. NRC should explicitly coordinate with EPA, DOT, and other agencies on an ongoing basis, and could consider calling for an interagency working group on VSL estimates. [JS-3-2]

NRC Response: The NRC agrees with this comment that coordination with other Federal agencies to estimate the VSL is appropriate because it saves NRC the cost of duplicating their

efforts, increases the rationality and transparency of NRC regulatory analyses, and provides a basis to compare costs and benefits of proposed regulations across Federal agencies. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment e3: UCS strongly supports the proposal to update the badly outdated $2,000-per-person-rem conversion factor and to develop a process for periodic review. The NRC continues to rely on a parameter that has not been updated in 20 years and is based on a value of statistical life far lower than the values used by other federal agencies. Use of this dated and out-of-step parameter is simply bad regulatory practice and leads to flawed analyses that undermine the credibility of NRC decisions. It is essential that federal agencies strive to achieve consistency in their respective regulatory analyses to engage meaningful assessment of federal actions that may have cross-cutting environmental and public health impacts across different sectors. [EL-11-1]

NRC Response: The NRC agrees with this comment, which summarizes some of the reasons this update to NUREG-1530 has been undertaken.

f. *Other Comments*

Comment f1 (combined NEI and JB): Page 26, line 12, Section 6.1, Number of Significant Figures RE: "In the future to allow for a more frequent adjustment for maintaining alignment with economic changes, the NRC staff should round this number to two significant figures."

In our view, "maintaining alignment with economic changes" is weak justification for rounding to two significant figures. If the "economic changes" contemplated are Inflation and Real Income Growth (two factors presented in the NRC's formula), they have been low for most of the past decade. With present socio-economic trends (e.g., globalization, recession or paltry real economic growth, historically low workforce participation rates, historic levels of governmental debt and deficits), they appear likely to remain low for the next decade as well. Thus "maintaining alignment" is unlikely to be a significant concern.

In addition, because of the imprecision of the overall process in which the dollar per person-rem conversion factor is used, two-digit precision in the dollar per person-rem conversion factor may be nothing but window dressing. For example, it is very difficult (i.e., effortful) to estimate costs of compliance with a proposed requirement to two significant figures. Estimates to an order of magnitude and single digit precision are typical early in the formulation of proposed new requirements. To achieve greater precision, the cost estimator must have a proposed regulatory requirement that is specific enough to enable: (a) an exact compliance solution to be defined, (b) a precise scope of work to be determined to provide that compliance solution, and (c) the timing of the work schedule to be gauged against plant outage schedules and work scopes. Thus, in a realistic assessment of the costs of compliance against the potential person-rem saved, the precision of the final answer would be controlled by the lower precision of the cost estimate. The precision of the final answer would not be improved by maintaining two-digit precision in the dose conversion factor. In other words, the supposed benefit of maintaining two-digit precision in the conversion factor is illusory when considered in context with its use.

On page 29, at lines 30-33, the NRC itself appears to acknowledge the irrelevance of two-digit precision in the cost-benefit calculation, in the following sentence: "…in recognition of the

uncertainties inherent in [the dollar per person-rem value], NRC staff and decisionmakers [sic] would typically rely more heavily on other considerations when the break-even cost-beneficial determination was close (e.g., within a factor of five)."

We recommend single-digit precision in the conversion factor as sufficient and practical. [NEI-2-6, JB-10-1]

NRC Response: The NRC disagrees in part with this comment that one significant figure would be sufficient, because the use of two significant figures is needed to properly account for updated values in the conversion factor and will enable a more gradual change in the factor over time. Language has been revised in NUREG-1530, Revision 1, to clarify and provide additional explanation.

Comment f2: UCS supports the approach outlined in NUREG-1530, Rev. 1, to systematically review and update the conversion factors to keep them current by considering both changing economic conditions and new scientific developments. To that end, UCS agrees that the conversion factor should be expressed to two significant figures. However, the NRC staff should make it clear that this choice is needed to properly account for updated values but does not reflect a technical judgement that this highly approximate concept can be quantified to such precision. [EL-11-4]

NRC Response: The NRC agrees with this comment. Language has been revised in NUREG-1530, Revision 1, to clarify and provide additional explanation regarding the use of two significant figures.

Comment f3 (combined NEI and JB): Page 29, lines 19-22, Section 8: "Second, for all other regulatory applications where $2,000 per person-rem has been used by the NRC, the NRC is not proposing that previous decisions be reviewed or updated based on this revised conversion factor policy."

It is unclear how NUREG-1530, Rev. 1, would apply to licensing actions already in progress which are based on the NUREG-1530, Revision 0. If Revision 1 is published prior to a final licensing decision is made (e.g., publishing a Final Supplemental Environmental Impact Statement being issued in a license renewal scenario), the analysis made using terms of NUREG-1530, Revision 0, should not be redone. The cited statement in NUREG-1530, Revision 1, should be modified to state clearly that existing licensing actions will not be reevaluated. [NEI-2-12, JB-10-1]

NRC Response: The NRC disagrees with this comment. The NRC would use the latest version of NUREG-1530 for licensing actions already in progress. However, based on standard NRC practice, the statement on page 29 is correct, "the NRC is not proposing that previous decisions be reviewed or updated based on this revised conversion factor policy." After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment f4 (combined NEI and JB): Page 31, lines 16-24, Section 9: "With respect to implementation, the NRC staff, licensees, and applicants may begin using the revised conversion factor in all regulatory applications discussed in Section 3 of this report, except for regulatory applications discussed in Section 3.1, "Routine Liquid and Gaseous Effluent Releases from Nuclear Power Plants."

The term “may begin using” is unclear. The question is when the new value becomes mandatory. The NRC should choose a specific date for implementation of NUREG-1530, Rev. 1. That date should be far enough in the future that: (1) the NRC can complete its update of the full suite of guidance documents for regulatory analysis; (2) any potential slippage in completing the guidance documents would not conflict with the NUREG-1530, Rev. 1, implementation date; and (3) implementation would be unlikely to have a significant effect on licensee plans already in progress. The NRC should communicate the implementation date through an appropriate official channel, e.g., an Information Notice supported by a Commission vote on a SECY. On the above basis, we would recommend January 1, 2020, as allowing time for slippage in completing the guidance update plus some lag to allow industry to complete applications that may be planned for submittal in the next few years. [NEI-2-13, JB-10-1]

NRC Response: NUREG-1530, Revision 1 will be in effect upon Commission approval. The staff anticipates that the Commission review of NUREG-1530, Revision 1 could be complete in early 2017. Note, however, that NUREG-1530, Revision 1 is not mandatory; it is one way of meeting the regulations.

Comment f5 (combined PJ and BA): “Federal Law prohibits discrimination against disabled persons. According to 29 U.S.C. 794, no person, solely by reason of their handicap, may be subjected to discrimination by any program or activity which receives federal funds. Since most of the entities involved in evacuating a population receive federal funds, it would be a contravention of federal law MA and NH to effectuate a plan that wholly ignores persons solely by reason of their handicapped status.”

I find everything the NRC does the past few years to be absolutely reprehensible. This proposal is a crime against humanity and violation of laws regarding the elderly, disabled and infirm.

Stop the idiocy now before you cause massive lawsuits demanding fulfillment of protection of environment and health. [PJ-4-1, BA-6-1]

NRC Response: The NRC considers this comment to be outside the scope of NUREG-1530, Revision 1. The purpose of NUREG-1530, Revision 1, is to determine values for the dollar per person-rem conversion factor for use in regulatory analysis. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment f6 (combined AA and DG): The NRC rule provides a VSL rated at around $36,000, and perhaps as low as $4,000 or less. When a life lost is worth so little, it actually encourages radioactive pollution. Is the NRC protecting public health, or promoting industry values that cheapen life and discount deaths.

All life is precious and priceless. There can be no dollar amount put in the grief and sadness of losing a family member to cancer, or a child sickened by cancer, or some other disease attributable to anthropogenic radiation created thru nuclear energy. [AA-5-1, DG-7-4]

NRC Response: The NRC considers this comment to be outside the scope of NUREG-1530, Revision 1. VSL concerns the small change in risk of mortality as a result of radiation exposure,

and is set at $9 million. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment f7: Whenever I see the phrase "to be consistent with" my ears immediately perk up and look for the real intention…usually a deception of some sort. So when I saw "in order to be consistent with the Commission's policy on metrication, the conversion factor should be expressed in dollars per person-Sv with the value in English units following parenthetically."

My take on this? Using Sv is just plain wrong, it is a huge measure of radiation, and a way to minimize things to the average citizen who hasn't studied radiation. Plus it makes the "payout" or value of life appear to be very high. It is much more appropriate to express all terms in mSv, please do so. [SO-9-4]

NRC Response: The NRC disagrees with this comment. Sv is the standard unit of radiation for the metric system, whereas rem (0.01 Sv) is the standard unit in the American system of measurement. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment f8: What about the costs related to plants and animals? This human centric view of things does limits the damage. Even if you don't care about animals…they have value to humans and you should care about that. [SO-9-6]

NRC Response: The NRC disagrees that plants and animals are treated inappropriately and considers this comment to be outside the scope of NUREG-1530, Revision 1. The NRC has set regulatory limits related to the doses to workers and members of the public from radioactive materials released from nuclear power plants. The NRC ensures that effluents from operating plants under its oversight are within the established limits under Title 10 of the *Code of Federal Regulations* (10 CFR), Part 20 and 10 CFR Part 50, Appendix I. The NRC regulations also incorporate by reference the Environmental Protection Agency's generally applicable environmental radiation standards set forth in 40 CFR Part 190. The regulations are set to protect workers and the public from the harmful health effects of radiation on humans, with the understanding that if levels are kept this low, they would also be protective of plants and animals.

Furthermore, in 1995, the NRC revised its dollar per person-rem conversion factor policy and limited it to human health effects. Therefore, offsite property damage costs, including effects on plants and animals, are estimated separately in order to account for impacts beyond human health concerns. These estimated costs include the impact in terms of food production, whether crop or animal food sources. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment f9: ALARA, well that will be conveniently be able to be discarded if the other NRC proposal generated from the radiation industry to throw out LNT [linear no-threshold] and then just, replace it with "hormesis, radiation is good for you" or as "doctor" Carol Marcus states…"why deprive them (the general public due to random radiation releases) of the benefits of radiation." [SO-9-7]

NRC Response: The NRC considers this comment to be outside the scope of NUREG-1530, Revision 1. The proposal regarding LNT is a separate NRC initiative that is independent from

NUREG-1530, Revision 1. After considering this comment, no change was made to NUREG-1530, Revision 1.

Comment f10: This document starts with a worthy premise, but the construct seems to be disingenuous. We all know the nuclear industry is challenged by more economic energy technologies. And even without the negative side effects of uranium mining and "normal" releases form nuclear plants, and the long term danger of nuclear waste…even without those, it would still make sense to not try to "support" an industry that has been proven to be too complex, too costly. [SO-9-8]

NRC Response: The NRC considers this comment to be outside the scope of NUREG-1530, Revision 1. The NRC mission is to regulate the civilian uses of nuclear materials in the United States to protect public health and safety, the environment, and the common defense and security. After considering this comment, no change was made to NUREG-1530, Revision 1.