

# **NUREG-1530, Revision 1, “Reassessment of NRC’s Dollar Per Person-Rem Conversion Factor Policy”**

April 2, 2015

# Meeting Ground Rules

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- Limit interruptions:
  - Turn off or silence cell phones.
  - Minimize side conversations.
- Speak one at a time.
- Identify yourself when speaking.
  - Please state your name, organization, and your comment or question.
  - If you are in the meeting room please speak into microphone so everyone on the bridgeline can hear.
- Be respectful of other speakers/participants.
- If participating by webinar please use the:
  - Chat function to send questions, or
  - Ask questions via the bridgeline at the designated opportunities.
  - Please mute your phone.

# Purpose, Outcome, Process

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- Purpose
  - To discuss the proposed Revision 1 to NUREG-1530.
- Outcome
  - To inform members of the public of the upcoming publishing of Revision 1 to NUREG-1530.
- Process
  - NRC will provide overview of background and history of dollar per person-rem, changes between the original NUREG-1530 published in 1995 and this revision, and the schedule for releasing this revision.

# Meeting Agenda

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9:00 am – 9:10 am	Welcome, Introductions, and Logistics
9:10am – 10:15am	NRC overview of NUREG-1530, Revision 1
10:15am – 10:30am	Break
10:30am – 11:50am	Questions and Answers
11:50am – 12:00pm	Concluding Remarks

# Meeting Documentation

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- The meeting summary will be posted on [www.regulations.gov](http://www.regulations.gov) within 30 calendar days after today's meeting.
- Search for docket ID “**NRC-2015-0063**” on [www.regulations.gov](http://www.regulations.gov) for these and other NUREG-1530, Revision 1, related documents.

# Dollar Per Person-Rem Defined

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- **Definition:** This factor translates “radiological exposure to a monetary value and, as such, allows for direct comparison between the potential health and safety benefits and the costs of a proposed regulatory initiative.”
  - 60 FR 65694.
- In short, dollar per person-rem is the dollar-value of the health impact of radiation exposure.



# Background and History

- The NRC first used a dollar per person-rem value in 1974 and 1975 for rulemaking that promulgated 10 CFR Part 50, Appendix I, which addressed routine emissions from nuclear power plants.
  - The value set was \$1,000 per person-rem. This is the only place in NRC regulations where a dollar per person-rem value is estimated.
- The \$1,000 value was used in numerous regulatory applications until NUREG-1530 was published in 1995.
  - NUREG-1530 recommended a value of \$2,000 per person-rem.
- Recently, on case-by-case bases, NRC has used higher dollar per person-rem values, in addition to the \$2,000 per person-rem value.
  - For example, in the regulatory analysis performed for COMSECY-13-0030 incorporated a higher value of \$4,000 per person-rem.

# Background and History (continued)

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- In 2010, the NRC staff began conducting research to update the dollar per person-rem value.
- SECY-12-0110 indicated that the NRC staff would work to update guidance documents relating to cost-benefit analyses, including NUREG-1530. The Commission approved the staff recommendation in an SRM in 2013.
- Further discussion can be found in Enclosures 7 and 8 in SECY-12-0110.
- Implementation plan can be found in SECY-14-0002.



# Regulatory Applications

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- Radioactive effluent system design approval decisions (10 CFR Part 50 Appendix I).
- 10 CFR Part 20 ALARA program.
- Regulatory analyses.
- Backfit and issue finality analyses.
- Environmental analyses (specifically SAMA and SAMDA analyses).

# Calculating Dollar Per Person-Rem

- How is dollar per person-rem calculated?
  - The NRC multiplies a current VSL (i.e., dollar-value) by a cancer risk coefficient (i.e., health impact of radiation exposure).
  - NUREG-1530, published in 1995, multiplied a VSL of \$3 million by a cancer risk coefficient of  $7.0 \times 10^{-4}$  per person-rem from ICRP 60. This approximates a dollar per person-rem value of \$2,000.
  - Currently, NUREG-1530 does not provide a method for adjusting this value into real dollars.

# Proposed Changes

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- Adopt new VSL and cancer risk coefficient.
- Adopt low and high dollar per person-rem values.
- Apply two significant figures in calculating dollar per person-rem instead of rounding to the nearest thousand dollar value.
- Adopt a methodology to maintain the dollar per person-rem conversion factor in current year dollars.
- Adopt Dose and Dose Rate Effectiveness Factor for high dose or high dose rate situations.

# Value of a Statistical Life

- VSL concept used widely throughout the Federal government to monetize the health benefits of a safety regulation.
- VSL is **NOT** a value placed on a human life, but a value that society would be willing to pay for reducing health risk.
- Example: if the annual risk of death is reduced by one in a million for each of two million people, that is “two statistical lives.”
  - (i.e., 2 million people  $\times$   $1/1,000,000 = 2$ ).
  - VSL is the monetization of the risk reduction across this population.

## **Value of a Statistical Life (*continued*)**

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- NRC utilizes the willingness-to-pay method for calculating VSL, consistent with other Federal agencies.
- NRC leveraged the research done by other Federal agencies in calculating VSL.
- As part of this revision to NUREG-1530, the NRC will propose a best estimate VSL calculation of \$9 million in 2014 dollars.



# Cancer Risk Coefficient

- NUREG-1530 uses the value from cancer risk coefficient value from ICRP 60, published in 1991, of  $7.0 \times 10^{-4}$  per person-rem.
- ICRP 103, published in 2007, presents an updated cancer risk coefficient of  $5.7 \times 10^{-4}$  per person-rem.
  - As part of this revision of NUREG-1530, the NRC will propose adopting this updated value.
  - ICRP 103 states the decrease is mostly due to improved methods of calculating health risks and advances in understanding of mutational processes.
  - Based on cancer risks across seven Western and Asian populations.
- Measures total detriment from radiation exposure (i.e., morbidity and mortality factors).

# Dollar Person-Rem Value

- $\text{VSL} \times \text{cancer risk coefficient} = \text{dollar per person-rem.}$
- $(\$9 \text{ million}) \times (5.7 \times 10^{-4} \text{ per person-rem}) = \$5,100 \text{ per person-rem.}$ 
  - This is NRC's proposed best estimate.
- For sensitivity analyses, NRC proposes to adopt low and high dollar per person-rem values.
  - The proposed low VSL value will be \$5.3 million and the proposed high VSL value will be \$13.2 million. Values are from the median of other Federal agency VSL estimates.
  - Cancer risk coefficient value remains as  $5.7 \times 10^{-4}$  per person-rem.
- NRC proposes adopting low and high values of dollar per person-rem, \$3,000 and \$7,500, respectively.

# Two Significant Figures

- NUREG-1530 currently rounds the dollar per person-rem factor to one significant figure.
  - Actual calculated value is \$2,100 per person-rem, but rounded down to \$2,000 per person-rem.
- If NRC updated this value consistently, new values would only occur when the dollar per person-rem factor can be rounded up to the nearest significant figure.
  - e.g., would increase from \$2,500 to \$3,000 due to rounding, but \$2,400 would round down to \$2,000.
- Using two significant figures will allow for more gradual changes to the factor.

# Methodology for Keeping Factor Current

- NRC proposed formula for keeping the dollar per person-rem factor current is:
  - $\text{Current VSL} = 2014 \text{ VSL} \times \text{Inflation} \times \text{Real Income Growth}^{\text{Income Elasticity}}$
- Revised NUREG-1530 will provide a worksheet for staff to use to update the dollar per person-rem value.
  - Formula will be used whenever the dollar per person-rem factor is used.
- Revisit every 5 years.



# Dose and Dose Rate Effectiveness Factor

- Intrinsic to the ICRP coefficient is a judgment that the per rem health detriment below certain doses and dose rates would be lower by a factor of 2, compared to the higher dose and dose rates where human health effects have been observed.
  - In some applications, a portion of the affected population could experience conditions in the higher dose or dose rate range.
  - NRC would double its dollar per person-rem value to these affected populations (e.g., \$5,100 to \$10,200).
- Only used in certain regulatory applications to a segment of the affected population.
- This factor is called the DDREF.



## Next Steps

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- The NRC staff expects to publish this draft revision in late April or early May.
- NRC staff will publish the document in the *Federal Register* for a 45 day comment period.
- NRC staff will consider additional public meetings, if needed.
- Projected issuance of the final NUREG will be in spring 2016.

# Questions?

# Closing Remarks

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# Background Slides

# Acronyms

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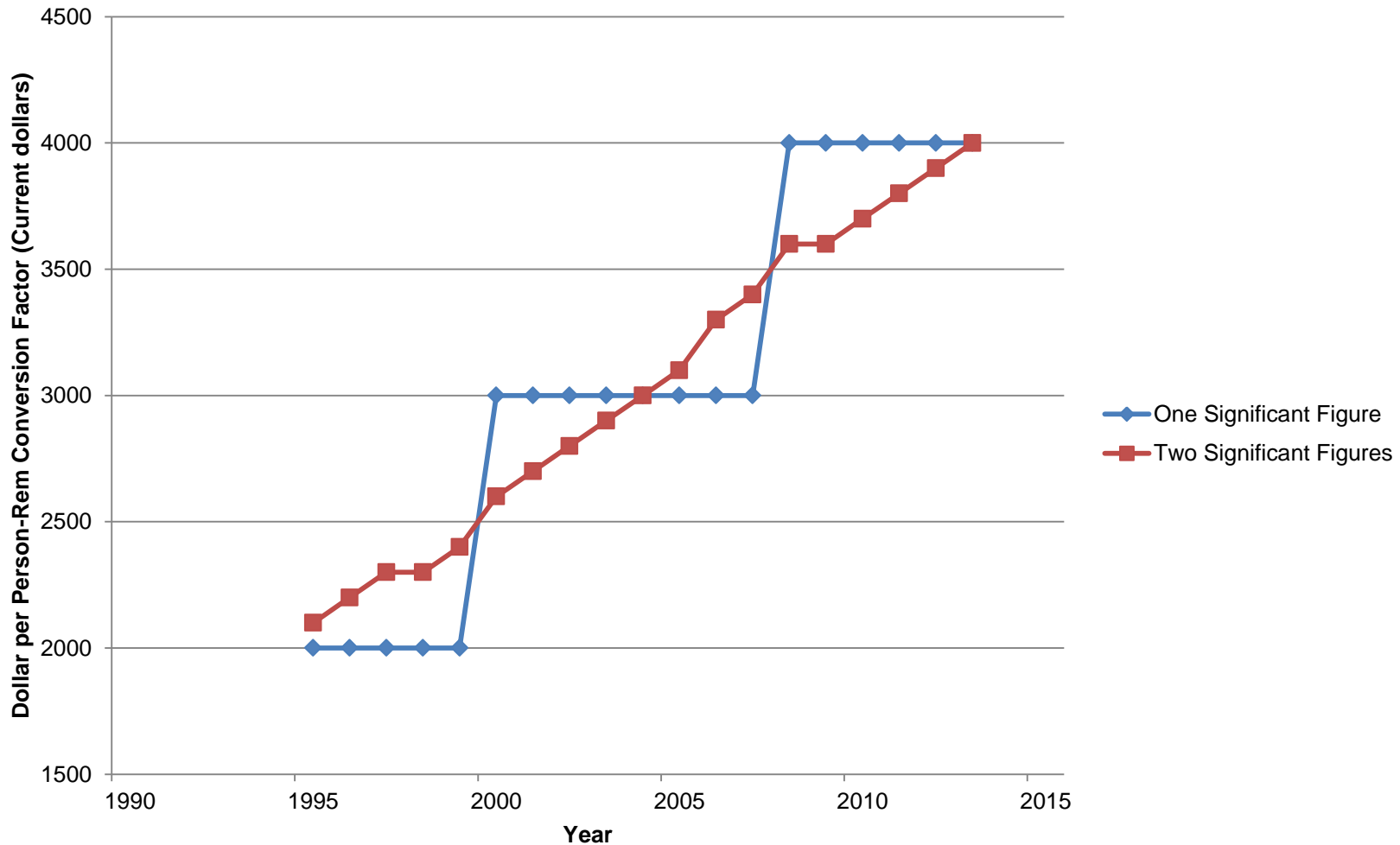
ADAMS	Agencywide Documents Access and Management System
ALARA	As low as is reasonably achievable
CFR	Code of Federal Regulations
CPI	Consumer Price Index
DDREF	Dose and dose rate effectiveness factor
EPA	U.S. Environmental Protection Agency
FR	Federal Register
ICRP	International Commission on Radiological Protection
ML	Main library
MUWE	Median Usual Weekly Earnings
NUREG	NRC technical report designation
OMB	U.S. Office of Management and Budget
SAMA	Severe accident mitigation alternative
SAMDA	Severe accident mitigation design alternative
SFP	Spent fuel pool
VSL	Value of a Statistical Life
WTP	Willingness to Pay



# Dollar Per Person-Rem Estimates Table

Estimate	VSL	Cancer Risk Coefficient	Dollar per Person-Rem
Best	\$9.0 Million	$5.7 \times 10^{-4}$ per rem	\$5,100
Low	\$5.3 Million	$5.7 \times 10^{-4}$ per rem	\$3,000
High	\$13.2 Million	$5.7 \times 10^{-4}$ per rem	\$7,500

# Difference Between Rounding to One and Two Significant Figures



# Formula Inputs

Factor (Base value)	Inflation (2014 = 236.7)	Real Income Growth (2014 = 791)	Income Elasticity
Source	Series: CPI-U. Series ID: CUUR0000SA0	Series: MUWE. Series ID: LEU0252881500	EPA White Paper
Calculation	Current Year Index Value/2014 Value	Current Year Index Value/2014 Value	0.5

# Example of Formula Use

- Assume inflation factor and real income growth factor both equal 1.04 for 2016.
- 2016 estimates:
  - VSL best estimate = \$9 million  $\times$  1.04  $\times$   $1.04^{0.5}$  = \$9.4 Million.
  - VSL low estimate = \$5.3 million  $\times$  1.04  $\times$   $1.04^{0.5}$  = \$5.6 Million.
  - VSL high estimate = \$13.2 million  $\times$  1.04  $\times$   $1.04^{0.5}$  = \$14 Million
- 2016 dollar per person-rem estimates:
  - Best: \$9.4 million  $\times$   $5.7 \times 10^{-4}$  per person-rem = \$5,400 per person-rem.
  - Low: \$5.6 million  $\times$   $5.7 \times 10^{-4}$  per person-rem = \$3,200 per person-rem.
  - High: \$14 million  $\times$   $5.7 \times 10^{-4}$  per person-rem = \$8,000 per person-rem.

# References

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- NUREG-1530
  - ADAMS Accession No. ML063470485
- OMB Circular A-4
  - [https://www.whitehouse.gov/omb/circulars\\_a004\\_a-4/](https://www.whitehouse.gov/omb/circulars_a004_a-4/)
- EPA report titled, “Valuing Mortality Risk Reductions for Environmental Policy: A White Paper”
  - <http://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0563-1.pdf/%24file/EE-0563-1.pdf>
- SECY-12-0110
  - ADAMS Accession No. ML12173A478
- SRM-SECY-12-0110
  - ADAMS Accession No. ML13079A055
- SECY-12-0157
  - ADAMS Accession No. ML12345A030
- COMSECY-13-0030 Regulatory Analysis
  - ADAMS Accession No. ML13273A628
- SECY-14-0002
  - ADAMS Accession No. ML1327A495