



EYE DOSE: U.S. NRC PERSPECTIVE

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Agenda:

- Issue: Lens of the Eye Dose Limits
- Timeline of Efforts
 - 2011: ICRP Recommendations
 - 2011: First Federal Register Notice (FRN) about Eye Dose
 - 2012: NRC Outreach: Blogs, Conferences, Meetings
 - 2012: Commission Notation Vote Paper
 - 2014: Advanced Notices of Proposed Rulemaking
 - 2016: Commission Notation Vote and FRN
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 - 2017: NCRP Commentary No. 26 “Guidance on radiation dose limits for the lens of the eye”
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- Conclusion: Discontinue Rulemaking, but monitor



Current NRC Lens of the Eye Limit

- 10 Code of Federal Regulations Part 20
 - Dose limit for the lens of the eye is 150 mSv (15 rem)
 - Radiation dose to the eye is defined as the lens dose equivalent (LDE) at a tissue depth of 0.3 cm
- 2011: ICRP Recommendation (ICRP 118)
 - 20 mSv (2 rem) per year, averaged over 5 consecutive years (i.e., 100 mSv (10 rem) in 5 years), with no single year exceeding 50 mSv (5 rem)

Timeline of Efforts

- 2011: ICRP Recommendations
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2011: NRC Federal Register Notice

NUCLEAR REGULATORY COMMISSION

[NRC-2009-0279]

New International Commission on Radiological Protection Recommendations on the
Annual Dose Limit to the Lens of the Eye

August 2011

Stakeholder
Outreach

AGENCY: Nuclear Regulatory Commission.

ACTION: Request for public comment.


SUMMARY: The U.S. Nuclear Regulatory Commission (NRC or the Commission) is continuing its stakeholder outreach of possible changes to the radiation protection standards by seeking public comment on the newly released International Commission on Radiological Protection (ICRP) recommendations for the limitation of annual dose to the lens of the eye. This significant new recommendation has not yet been the subject of any stakeholder or public interactions on any potential changes to the NRC's radiation protection regulations. The NRC has not initiated rulemaking on this subject, and is seeking early input and views on the benefits and impacts of options to be considered before making any decision on whether to consider this issue for future rulemaking. Stakeholders and the public are encouraged to submit comments concerning potential impacts, burdens, benefits, and concerns on the issues discussed in this notice.

Benefits,
burdens,
impacts and
concerns for
future
rulemaking



2011: NRC Federal Register Notice

- Queried the Radiation Exposure Information and Reporting System (REIRS) database for dose records

NRC FORM 5 (10-2017) 10 CFR PART 20		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0006		EXPIRES: 10/31/2020	
		OCCUPATIONAL DOSE RECORD FOR A MONITORING PERIOD		Estimated burden per response to comply with this mandatory collection request: 20 minutes. This information is used to ensure that doses to individual do not exceed regulatory limits. This information is required to record/annually report individual occupational exposure to radiation to ensure that the exposure does not exceed regulatory limits. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0006), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.			
1. NAME (LAST, FIRST, MIDDLE INITIAL)		2. IDENTIFICATION NUMBER		3. ID TYPE		4. SEX <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE	
5. DATE OF BIRTH (MM/DD/YYYY)		6. MONITORING PERIOD (MM/DD/YYYY - MM/DD/YYYY)		7. LICENSEE NAME		8. LICENSE NUMBER(S)	
						9A. <input type="checkbox"/> RECORD <input type="checkbox"/> ESTIMATE	
						9B. <input type="checkbox"/> ROUTINE <input type="checkbox"/> PSE	
INTAKES				DOSES (in rem)			
10A. RADIONUCLIDE	10B. CLASS	10C. MODE	10D. INTAKE IN μCi	EFFECTIVE DOSE EQUIVALENT (FOR EXTERNAL EXPOSURES) (EDEX)	11A.		
				DEEP DOSE EQUIVALENT (FOR THE ENTIRE MONITORING PERIOD) (DDE)	11B.		
				LENS (EYE) DOSE EQUIVALENT (LDE)	12.		
				SHALLOW DOSE EQUIVALENT, WHOLE BODY (SDE,WB)	13.		
				SHALLOW DOSE EQUIVALENT, MAX EXTREMITY (SDE,ME)	14.		
				COMMITTED EFFECTIVE DOSE EQUIVALENT (CEDE)	15.		
				COMMITTED DOSE EQUIVALENT, MAXIMALLY EXPOSED ORGAN (CDE)	16.		
				TOTAL EFFECTIVE DOSE EQUIVALENT (ADD BLOCKS 11A AND 15) (TEDE)	17.		
				TOTAL ORGAN DOSE EQUIVALENT MAX ORGAN (ADD BLOCKS 11B AND 16) (TODE)	18.		
				19. COMMENTS			

2011: NRC Federal Register Notice

Results of REIRS Search/Preliminary Analysis

- REIRS data for the past 5 years (2006-2010) :
 - ~1,000 cases where a 20 mSv (2 rem)/year eye dose was exceeded
 - ...but none exceeded the current limit for the lens of the eye
- Not included, not under US NRC jurisdiction:
 - machine-produced radiations (e.g., x-rays),
 - medical interventional radiology and cardiology

Summary of Federal Register Notice Options

1. No change
2. Change to ICRP Recommendations
3. Change to a single limit of 50 mSv (5 rem) or 20 mSv (2rem)



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2012: NRC Outreach: Blogs, Conferences, Meetings

- Blog: 6 comments
- Published in ICRP, Association for Physicist in Medicine
- Conferences, Meetings
- Advisory Committees




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Are We Seeing Clearly?

 Posted by Moderator on September 22, 2011

 6 Comments



The lens of the eye is one of the more sensitive tissues in the body to radiation, especially related to forming cataracts. The current NRC dose limit for the eye is 15 rem in a year, which is lower than the limits for other single organs. (The unit "rem" is used to measure the amount of radiation you get from a source – 0.1 rem is the average amount each of us gets each year from naturally occurring radiation.)

Now, the [International Commission on Radiological Protection \(ICRP\)](#) has found that the eye is more sensitive than previously thought. Based on this, the ICRP has recommended a new lower dose limit for the lens of the eye. The new

recommendation is two rem a year, averaged over the course of five years, with no single year exceeding five rem. Copies of the [ICRP statement](#) are available on the NRC website.

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2012: Commission Notation Vote Paper

April, 2012

POLICY ISSUE NOTATION VOTE

April 25, 2012

SECY-12-0064

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: RECOMMENDATIONS FOR POLICY AND TECHNICAL DIRECTION TO
REVISE RADIATION PROTECTION REGULATIONS AND GUIDANCE

PURPOSE:

The purpose of this paper is to summarize the staff's interactions with stakeholders as directed in Staff Requirement Memorandum (SRM)-SECY-08-0197, "Options to Revise Radiation Protection Regulations and Guidance with Respect to the 2007 Recommendations of the International Commission on Radiological Protection," and to request Commission approval of the staff's recommendations for policy and technical directions to revise the U.S. Nuclear Regulatory Commission's (NRC's) regulations and guidance for radiation protection.

ICRP 103 (2007) and
ICRP 118 (2011)
Recommendation

Development of policy
and technical
information



Technical Issues: Yes, No, Caution

- Methodology and Terminology
- Limits for Occupational Total Effective Dose Equivalent
- Occupational Limit for the Lens of the Eye
- Occupational Limit for the Embryo/Fetus
- ALARA Planning
- Reporting of Occupational Exposure
- 10 CFR Part 50, Appendix I
- Units of Radiation Exposure and Dose (use both traditional and SI units)



Commission Paper: SECY-12-0064

Stakeholder views

- **Agreement State supported** but noted demonstration of compliance could be a problem
- Concerns were also raised about the comparability of the endpoint, namely a **cataract in the eye, versus the morbidity and mortality from cancer.**
 - lens replacement for cataracts is a routine procedure, and a significant percentage of the population will experience cataracts as they age for reasons unrelated to occupational radiation exposure.
- Therefore, some stakeholders suggested that a reduction to 5 rem (50 mSv) in a year might be more appropriate than the ICRP recommendation.
- **Cost** associated with change to ICRP 118 include changes in programs, procedures, monitoring and record keeping

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2014:Advance Notice of Proposed Rulemaking

- **Purpose:** potential changes to the NRC's current radiation protection regulations.
- **Goal:** achieve greater alignment between the NRC's radiation protection regulations and the recommendations contained in ICRP Publication 103, primarily with respect to the recommendations concerning dose assessment methodology and terminology.
- Additionally:
 - Continue discussions with stakeholders regarding possible revisions to the dose limit (150 mSv (15 rem)) for the lens of the eye
 - Proposal: Reduction to 50 mSv (5 rem) LDE

2014:Advance Notice of Proposed Rulemaking

Seven Lens of the Eye Questions

1. Is closer alignment or adoption of the ICRP Publication 118 recommendations regarding the dose limits to the lens of the eye appropriate given the scientific information now available?
2. How should the impact of a radiation induced cataract be viewed in comparison with other potential radiation effects?
3. What mechanisms could be applied to keep the cumulative exposure to the lens of the eye below the threshold of 0.50 Gy (50 rad)?
4. What methods should be allowed for measurement or assessment of the dose to the lens of the eye?
5. What methods should be allowed for recording dose when the eyes are protected?
6. What are the potential operational impacts?
7. What are the potential impacts on State regulatory programs?



Summary of ANPR

- July 2014: Published Federal Register Notice
 - Supported by six issues papers
 - With regards to lens of the eye
 - Continue Discussions with stakeholders
 - Proposal: Reduction to 50 mSv (5 rem) LDE
 - 7 Questions Related to the Lens of the Eye
- Comment period end June 2015
 - 11 months after first published
-6 months later.....

**January 2016: Commission Notation Vote and FRN
Decision to Discontinue Rulemaking**

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2016: Commission Notation Vote

January 2016

POLICY ISSUE Notation Vote

Activities to shed, de-prioritized
or performed with fewer
resources

January 31, 2016

SECY-16-0009

FOR: The Commissioners

FROM: Victor M. McCree
Executive Director for Operations

Maureen E. Wylie
Chief Financial Officer

SUBJECT: RECOMMENDATIONS RESULTING FROM THE INTEGRATED
PRIORITIZATION AND RE-BASELINING OF AGENCY ACTIVITIES

PURPOSE:

This paper provides the results of the re-baselining of agency activities and requests Commission approval to implement recommendations on work to be shed, de-prioritized, or performed with fewer resources. The paper also requests authorization for the Executive Director for Operations (EDO) to sign the public notifications for the rulemaking activities the Commission approves for termination or delay.

2016: Federal Register Notice: Discontinue Rulemaking

- Lists **151 individual activities** that staff recommends be shed, de-prioritized, or incrementally reduced
- These reductions total
 - ~\$17M in contract dollars, and
 - ~187 FTE.
- List **4 Rulemaking activities** for shedding

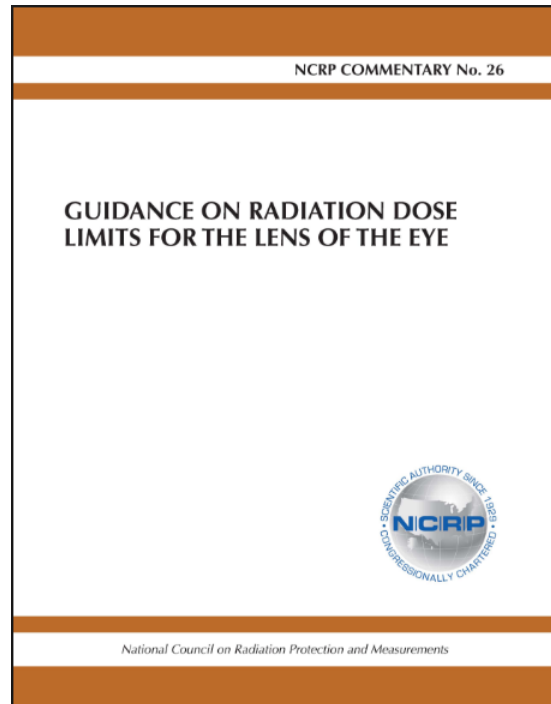
List of FY 2017 Funded Rulemaking Activities Recommended for Shedding	
1	Revision to 10 CFR Part 20 to Address International Recommendations
2	Revision to 10 CFR 50.46(a) to Add a Voluntary Risk-Informed Loss-of-Coolant Accident Analysis Option
3	Revision to 10 CFR Part 21 Reporting Requirements
4	Revision to 10 CFR Part 50, Appendix I to Address International Recommendations

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As in prior NCRP Report No. 132, use absorbed dose when addressing specific tissue reactions (or deterministic effects).

- Reduce Occupational Annual lens of eye limit to **50 mGy**.
- Member of Public Annual lens of eye limit as **15 mGy**.

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2017 onward....monitoring.....

- Regulatory Information Conference

- Sponsored a session to

- ICRP Recommendations
 - NCRP proposed reduction
 - Views from a Health Physicist: Chris Passmore, CHP, Vice President – Dosimetry Services, Landauer, Inc.
 - EPRI Lens of the Eye R&D: Phung Tran.



- Canadian RAMP Meeting

- Development of a Deterministic Eye Dosimetry Model
 - Lens of the Eye Symposium to listen and learn



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Questions?

