



Consideration of Revisions for Environmental Radiation Protection Standards from Nuclear Power Operations

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Presentation Outline

- Background
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- ANPR Development
- Issues for Public Comment
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Background

40 CFR Part 190 establishes radiation protection standards for nuclear power operations

- Applies to U milling, U conversion & enrichment, U fuel fabrication, nuclear power plants, & reprocessing facilities involved in electricity production
- Final Rule published Jan 13, 1977 - 40 CFR Part 190

Issues

- Dosimetry/science is outdated
- No groundwater protection provisions
- Enforcement issues associated with 40 CFR 190.10 (b)



Background

40 CFR 190 contains two main radiation protection provisions:

- Public Dose limits (ICRP-2 based)
 - Dose to any individual shall not exceed 25 mrem/yr whole body, 75 mrem/yr to thyroid, or 25 mrem/yr to any other organ
- Radionuclide Release limits
 - Annual limits on total quantities of radioactivity entering the environment for certain radionuclides per Gigawatt electricity produced; primarily for reprocessing
 - 50,000 curies Kr-85
 - 5 millicuries I-129
 - 0.5 millicuries combined of Pu 239 & other alpha emitters



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Rationale for Existing Standards

In developing the 1977 standards the Agency stated that 'standards for the nuclear power industry should include:

- Total radiation dose to populations
- Maximum dose to individuals
- Risk of health effects attributable to these doses including future risk from the release of long-lived radionuclides to the environment
- The effectiveness and costs of technology available to mitigate these risks through effluent control'



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Rationale for Dose Limits

In developing the 1977 standards the Agency found that the '...most prudent basis for relating radiation dose to public health continues to be to assume a potential for health effects exists at all levels of exposure' (aka Linear Non-Threshold concept)

- Dose limits designed to limit population and individual exposures near fuel cycle facilities
- Sets a total dose received from the fuel cycle as a whole and from ALL pathways



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Basis for 1977 Radionuclide Release Limits

Health impact analysis forms the initial basis for limits

- Environmental dose commitment concept used to assess impact of releases versus local population focused analysis
 - Long-lived radionuclides can have lasting impact beyond local communities
- Collective dose concept
 - Use of small potential health effects to large populations as impact to be minimized
 - Not currently endorsed by international or national technical bodies for use in setting standards

Influenced by cost effective analysis of effluent controls



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Radionuclides Considered for 1977 Limits

Analysis conducted yielded five radionuclides of concern released into the environment on a per Gigawatt electricity produced basis

- H-3
 - No known treatment technologies
- Carbon-14
 - 60% could be contained economically, rest released to atmosphere
- Kr-85
 - Collection and retention available at high cost
- I-129
 - Treatment efficiencies estimated at 99.9%
- Pu-239 and other alpha-emitters with half-lives > 1 yr
 - Controllable by the use of HEPA filters



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Agency's Effort to Revise These Standards

The Agency intends to revise its standards in 40 CFR Part 190 to reflect current science – Advanced Notice of Proposed Rulemaking under development



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Issue Summaries

General Question – How should the Agency update the requirements for radiation protection from nuclear power operations?

- Consensus support that some revisions are necessary
- Divergence on some of the specific provisions that we may propose

Specific Issues for Comment

- Risk
- Dosimetry
- Radionuclide release limits
- Water resource protection
- Spent fuel storage
- New Nuclear Technologies




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Issue 1 – Risk standard

Should the Agency express its limits for the purpose of this regulation in terms of radiation risk or radiation dose?

- Dose has traditionally been used for developing radiation protection standards to either workers or the public
- Agency uses risk to determine acceptable levels of public protection
 - 10^{-4} to 10^{-6}
- Could risk be used as the radiation protection standard?




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Issue 2 – Updated Dose Methodology

If the Agency continues to use a dose limit in these standards, how should updated dosimetry be incorporated?

- Existing standard is based on ICRP-2 dose methodology
- In the scientific community - critical organ concept abandoned for “effective dose equivalent” concept
 - We believe the effective dose methodology is more appropriate than 1959 ICRP 2 critical organ methodology
- Revised risk estimates are now available
- Updated dosimetry is now available allowing the calculation of dose to ‘sub-populations’ (children)



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Issue 3 – Radionuclide Release Limits

Should the Agency retain the radionuclide release limits in an updated rule and, if so, what should the Agency use as the basis for any release limits?

- Regulatory limits were focused on commercial reprocessing of spent fuel being widely conducted
- Based on collective dose concept, attributing very small doses to large populations
- Implementation concerns with enforcing any 'potential' non-compliance



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Issue 4 – Water Resource Protection

How should a revised rule protect water resources?

- Environmental contamination through water pathway was not believed to be a major contributor
- Experience has indicated that the likelihood of ground water contamination is much greater than previously believed
- Environmental problems could linger on long past the operational phase of facilities



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Issue 5 – Spent Fuel Storage

How, if at all, should a revised rule explicitly address storage of spent nuclear fuel?

- Applicability of standards with respect to the environmental standards for management and storage of spent fuel (40 CFR part 191) not clear
- Spent fuel is stored at facilities in much greater quantities and for much longer durations
- Ability of these wastes to contribute to higher public doses



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Issue 6 – New Nuclear Technologies

What new technologies and practices have developed since the 1977 rule was issued, and how should any revised rule address these advances and changes?

- Existing rules sets limits that apply to "Uranium Fuel Cycle"
- Other nuclear energy fuel cycles exist
- How close are these new technologies to feasible implementation?
- Do small modular reactors pose unique environmental considerations?



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Public Outreach and Input

We anticipate needing at least a 90 day comment period for the ANPR

Public Meetings at 3 locations – under consideration are:

- Washington DC
- Atlanta, GA
- Chicago, IL

Other Communications venues

- Presentation at technical conferences



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Summary

- EPA will be revising its environmental protection requirements to nuclear power operations – 40 CFR Part 190
- Our current efforts are seeking specific comments on 6 critical issues
- We are open to, and will accept comments on other facets of the standards



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Thank you!

Questions?



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