



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

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Presentation Outline

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Background

40 CFR Part 190 establishes environmental 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- Dosimetry/science is outdated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, and 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



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'



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



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



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



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



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



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?



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)



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



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



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



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?



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



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



Thank you!

Questions?

