# RADIATION PROTECTION STANDARDS: THE NRC PERSPECTIVE

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# Introduction

The purpose of this paper is to summarize the role and viewpoint of the US Nuclear Regulatory Commission on radiation protection standards, specifically the major revision of 10 CFR Part 20 and the criteria for "below regulatory concern."

## NRC Requirements

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NRC requirements are established by Title 10, Chapter 1, of the Code of Federal Regulations. Part 20, "Standards For Protection Against Radiation," contains the radiation protection requirements for all licensees.

Even though the regulations now fill over a thousand pages, generally they are not detailed enough to constitute working-level standards. The details are provided by approximately 375 regulatory guides, numerous NUREG reports and other supporting documents.

The NRC relies heavily on consensus standards and (especially in radiation protection) the recommendations of authoritative organizations such as the International Commission on Radiological Protection (ICRP), the International Commission on Radiation Units and Measurements (ICRU), and the National Committee on Radiation Protection and Measurements (NCRP).

The current ICRP recommendations are strongly theoretically based and therefore difficult to include directly into a practical regulatory program. Impetus to follow ICRP was added January 20, 1987 when President Reagan approved the new "Radiation Protection Guidance to Federal Agencies for Occupational Exposure." We are proceeding to revise 10 CFR Part 20 so it is generally consistent with ICRP-26. Corresponding changes in numerous other radiation protection standards are expected to follow.

# 10 CFR Part 20, Standards for Protection Against Radiation

The proposal is for a complete revision of our basic radiation protection standards. The changes are being made for consistency with the Federal Guidance, ICRP-26 and NCRP-91 rather than to correct deficiencies. The Commissioners, as of July 1, 1989, have not yet approved the proposed revision of Part 20. The final regulation may differ from the staff's proposal. The principal proposed changes are as follows:

- Control of internal doses by limiting the weighted sum of doses to the principal body organs, i.e. the "committed effective dose equivalent;"
- Limiting the weighted sum of internal and external doses, rather than having separate limits for each;
- Limiting the annual dose to any member of the public to
   0.1 cSv (rem);
- Revising the limits on concentrations of airborne radioactivity, now the "derived air concentrations" (DAC), and on concentrations in liquid effluents;
- 5. Lowering limits on disposal into sanitary sewer systems;
- Lowering the occupational annual dose limit to 5 cSv (rems), i.e. eliminating the 5(N - 18) provision;
- Limiting the dose to a declared pregnant woman to 0.5 cSv (rem) for the gestation period;
- 8. Requiring special access controls for "very high radiation areas," [where a dose of 500 cGy (rads) could be received in an hour at a distance of 1 meter from the

source]; and

9. Increasing requirements on the use of respiratory protection, including a determination of medical fitness by a physician.

There are numerous other provisions that may prove important. For example, the limit on radon in unfiltered gaseous effluents is 0.1 pCi/L. This limit is about 33% below the average concentration in outdoor air and far below most indoor concentrations.

The proposed Part 20 does not remove the requirement for prior NRC approval of incineration of radioactive waste nor does it address "below regulatory concern."

The current proposal is different in many particulars from the version published for comment in the Federal Register on January 9, 1986. These differences largely are responses to the 813 public comment letters. Other changes resulted from the backfit analysis (Federal Register, August 29, 1986) and from staff comments.

# Below Regulatory Concern

Nature, technology and our regulatory system present a formidable problem in the control of small quantities of radioactive material. Nature's contribution was to make all material things radioactive. Technology then provided the means to detect and measure the radioactivity in even the least radioactive of materials. Finally, our present regulatory system fails to provide a firm basis for excluding any activity from control. The limits of regulatory control are being established on an <u>ad hoc</u> basis. An attempt is now being made to establish logical and legal bounds but it is a formidable problem.

The NRC staff's proposed policy statement on "exemption from regulatory control" was published for comment on December 12, 1988 in the Federal Register. Over 225 comment letters were received and analyzed. An international workshop on the subject was conducted in October 1988, with representatives of 11 other countries (NUREG/CP-0101). With this background, a revised proposed policy statement was submitted to the Commissioners on June 16, 1989. The Commissioners were briefed on July 11, 1989 and have not yet responded.

The NRC staff's proposal addresses "evemption from regulatory control" because "below regulatory concern" is reserved for low level radicactive waste. Also, the NRC would retain the right to verify that the conditions of exemptions were being met. The proposal is for a policy statement that could be used as a basis for either rulemaking or licensing action. The proposal would not establish firm bounds but offers the following criteria:

1. NRC deems it of net benefit to society;

2. the maximum annual dose to any individual would not

exceed 0.1 mSv (10 mrems); and

 the annual collective dose would not exceed 5 person-Sv (500 person-rems).

Practices would be exempted on a case-by-case basis . The "net benefit" criterion must be met in all cases. If the dose criteria are not met, an specific analysis would be necessary to show the exemption of the practice would be ALARA.

# Summary

The NRC is modifying its radiation protection requirements to be consistent with ICRP/NCRP recommendations and to avoid undue controls on trivial risks. The problems are formidable and final resolution of many issues may not occur this calendar year.



This is the official call for papers for the ANS 1989 Winter Meeting. You are encouraged to submit summaries of papers describing work that is NEW, SIGNIFICANT, and RELEVANT to the nuclear industry. To facilitate an adequate review, a summary of your paper must be in the mail to ANS headquarters by June 30, 1989. The National Program Committee will then review your summary and will notify you of their decision to accept or reject it by August 16, 1989. ANS will publish all accepted summaries in the TRANSACTIONS. You will present your paper orally at the meeting and are expected to register for the meeting. You may publish the completed paper elsewhere if you wish, but your summary becomes the property of ANS. It is your responsibility to protect classified or proprietary information.

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- 2. Description of the actual work-must be NEW and SIGNIFICANT.
- 3. Results-discuss their significance.
- References----if any, must be closely related published works. Minimize the number of references. Do not present a bibliographical listing.

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- 4. Limit title to ten words; limit listing of authors to three or fewer if possible.
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#### SUBJECT CATEGORIES FOR CONTRIBUTED AND INVITED SESSIONS

- 1. BIOLOGY AND MEDICINE-M. Guven Yalcintas (615/574-4495) BIOLOGY AND MEDICINE---M. Guven Yalcintas (615/574-4495)
  1.1 Biology and Medicink---General
  \*\*1.2 Recent Advances in Activation Analysis
  \*\*1.3 Activation Analysis of Biological Materials
  \*\*1.4 Neutron Activation Analysis for Mercury
  \*\*1.5 Organic Synthesis with Isotopic Carbon and Hydrogen
  \*\*1.6 Investigations of Kidney Diseases Using Radionuclides [ESD]
  EDUCATION AND TRAINING--Gregg Smith (914/681-6313)
  2.1 Innovations in Nuclear Engineering Education and Training
  \*2.2 Division Chair's Roundtable: Integrating Training and Education
  \*\*2.3 Other Training Needs Beycred the Requirements
  \$2.4 Tutorial: Modular HTGRs
  ENVIRCOMENTAL SCIENCES---Carl Mazzola (803/725-3746)
- ENVIRONMENTAL SCIENCES—Carl Mazzola (803/725-3746) 3.1 Environmental Sciences—General
  - \*\*3.2 Public Concerns About Radioactive Materials in the Environment (RPSD)
  - \*\*3.3
  - ##3.4
  - Risk from Man-Made Versus Naturally Radioactive Materials Radioactive and Toxic Material Epidemiological Studies Regional Environmental Measurements of Releases from Civilian \*\*3.5 Nuclear Facilities
  - \*13.6 \*\*3.7

  - DOE FRMAP Implementation Program DOE FRMAP Implementation Program Dose Assessment Under Complex Meteorological Conditions \*\*3.8

  - \*\*3.9 Geographic Information Systems \*\*3.10 Chernobyl Accident Environmental Studies [RPSD] FUEL CYCLE AND WASTE MANAGEMENT—Hassan A. Hassan
  - (804/385-3208)
  - 4.1
  - Fuel Cycle and Waste Management---General Interaction Between Reload Design and Fuel Cycle Economics \*\*4.2
  - \*\*4.3 International Progress in Fuel Reprocessing and Separation
  - Technology Current Utility Fuel Cycle Cost Evaluation Practices 884 4
  - \*\*4.5
  - Technical & Design Update of the LLW Compact Program [ESD] Status of the Yucca Mountain Project \*\*4.6
  - Waste 'Aanagement at DOE Defense Nuclear Facilities [ESD] LLW Disposal Costs for New Facilities \*\*.1 7
  - \*\*4.8
  - \*\*4.9 Advances in Spent-Fuel Handling and Interim Storage Cask Design
  - \*\*4.10 Waste Management Systems Evaluation and Project Decision Analysis Simulations
  - \*\*4 11
  - Analysis Simulations Waste Isolation Pilot Plant (WIPP) Operations Regulatory Status of Naturally Occurring Radioactive Materials and Wastes Below Regulatory Concern [ESD, RPSD] Directions for Monitored Retrievable Storage Planning [ESD] Institutional/Public Interaction Dynamics and Techniques \*\*4.12
  - \*'4.13
  - \*'4.14
  - Utility Operational Experience with Waste Management [ESD, \*14.15 ROD
- FUSION ENERGY-Richard F. Mattas (312/972-8673) 5.
- 5.1 Fusion Energy-General HUMAN FACTORS-Philip Berghausen, Jr. (415/692-0652) \*\*6.1 Current Issues in Human Reliability
- ##16 2 Accorditation and Requalification Issues [ETD, ROD] Alternative Approaches to Fulfilling the Expected NRC Degree \*\*6.3 Requirements
- \*\*6.4

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- Mental Modeling Applications of Artificial Intelligence (AI) in Nuclear Engineering \*\*6.5 (MCD)

- \*\*6.6 Expert Systems in Maintenance [FCWMD]
   ISOTOPES AND RADIATION—Ned Wogman (509/375-2451)
   7.1 Isotopes and Radiation—General
   \*\*7.2 Charged Particle Data—Measurement, Theory, and Evaluation [RPSD]
- 887 3
- ##7.4
- 807 5
- Forensic Activation Analysis Activation Analysis of Environmental Materials [ESD] Processing and Monitoring Transuranium Isotopes IAEA Nuclear Material Measurement Target Values Aspects of Material Control to Enhance Safeguards \*\*7.6
- ##7 R Experience with Implementation of DOE Order 5633.3 \*\*7.9
- Experience in Large-Scale Landmass Decontamination [ESD, PCW/MD] \*\*7.10 The Value and Cost of University Research Reactors to Society
- (ETD)
- \*\*7.11 Safeguards Aspects of Spent-Fuel Management [FCWMD] MATERIALS SCIENCE AND TECHNOLOGY-G. E. Lucas
- 8 (805/961-4069)
  - \*8.1 Applications of Ferritic Steels for Nuclear Power Systems Materials Aspects of Fabrication and Reprocessing of Liquid-Metal Reactor (LMR) Fuels (FCWMD) Behavior and Properties of LMR Fuels \*8.2

  - \*83
- 0 (505-667-577)
  - Mathematical Modeling-General 0
    - 92
    - Reactor Physics Methods Methods in Thermal Hydraulics and Reactor Safety (NRSD)
    - b d
  - \*\*9.5
  - Methods in Neutral and Charged Part cle Transport Visualization of Large-Scale Calculations Chaos and Other Nonlinear Phenomena in Nuclear Energy \*9.6
- \*\*10.1 Safety Margins in In Size Measurements

  - \*\*10.3 Safety Margins in the Control of Moderation and Poisons

- \*\*10.4 Safety Margins in Transportation and Storage
- \*\*10.5 Safety Margins in Fissile Material Monitors
   \*\*10.6 Safety Margins in Probabilistic Risk Analysis
   NUCLEAR REACTOR SAFETY—Debu Majmdar (208/526-1805)
  - Reactor Safety-General Thermal and Fast Reactor Safety
    - 11.2 Reliability and Risk Assessment
    - 11.4
    - 11.5
  - Severe-Accident Analysis and Mitigation [ESD] Off-S Consequences of Severe Reactor Accidents [ESD] Safety and Reliability of Space Nuclear Power Systems [ESD] -Roger Nelson (504/595-2869) SP-100 Ground Test Engineering \*\*11.6
- 12. POWER-
  - 12.1
  - Safety and Reliability Implications of Nuclear Power Reactor Support Systems [NRSD] Quality Achievement: Influencing the External Vendor \*\*12.2
  - \*\*12.3 Environment
  - Configuration Management: Are You Operating the Plant You \*\*12.4 Licensed? [ROD]
  - \*\*12 5
  - \*\*12.6
  - \*12
  - Licensed? [ROD] Prudence Assessments—Preparation, Conduct, and Comparisons impact of Outside Evaluation Programs on Engineering Excelience Plant Security Systems—Innovations, Upgrades, and Issues The Role of Nuclear Power in Mitigating the Greenhouse Effect \*\*12.8 (ESD) \*\*12.9
  - Recent Flow Stability Issues
  - Effects of Defense Programs on Public Perception of Commercial Nuclear Power Plants \*\*12.10

Radiation Pransport Methods and Cata (MCD) Neutronics and Shielding Applications Source Terms and Accident Analysis (ESD) Radiation Measurement Techniques (ESD) Physical, Radiobiological, and Legal Aspects of Hot Particles Radiation Protection Aspects of Radon (IRD) Shielding Design for Spent-Fuel Storage and Transportation Casks Participation

Radiation Protection Standards De Minimis and Below Regulatory Concern [ESD, FCWMD] Performance Assessment of LLW Disposal Facilities [ESD,

FCWMD] LLW Classification-Measurement and Analysis (FCWMD)

Impact of Turbit: Performance and Maintenance on Plant Reliability [PD] Impact of Station Blackbut Ruling on Plant Operations Avoiding Plant Shutdown Through Design Basis Reconstitution Inspact of the Commercial Nuclear Power Plant Maintenance Rule Plant Performance Indicators—Slave or Master? Striving for Excellence Through Professionalism Economic Trends in Plant Operations (PD) Non-U.S. Rector Operating Experience—Problems and Solutions (PD)

Review of the Cootents and Performance of ENDF/B-VI Applications of Improved Physics Methods in Reactor Monitoring

- \*12.11 How Are Individual Plant Examinations Working? [NRSD]
   \*12.12 Licensing Issues of Centralized Generating Companies
   13. RADIATION PROTECTION AND SHIELDING—William Urban

  - (505/667-4024)

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Oral presentations are normally allotted 20 minutes for presentation and questions.

(ESD)

Reactors [NRSD]

#17.6 Thermal Hydraulics of Reactor Operations

published in division proceedings

ee --- invited and contributed papers

INRSD

6611

-Invited supers

-Panel discussion -Tutoria!

[] ---Cosponsoring division

Operational Radiation Protection [ROD] Radiation Transport Methods and Data [MCD] 13.1 13.2

REACTOR OPERATIONS—C. Thomas Snow (703/894-515))
 \*'14.1 Solutions to Present-Day Plant Operating Problems
 \*\*14.2 Impact of Turbit's Performance and Maintenance on Plant

REACTOR PHYSICS—Charles Rombough (817/478-1826)
 15.1 Reactor Analysis Methods (MCD)
 15.2 Thermal Reactor Design, Validation, and Operating Experience
 15.3 Fast Reactor Design, Validation, and Operating Experience
 15.4 Nuclear Data and Instrumentation [ESD]

\*\*15.7 Advances in the Application of Sensitivity Theory and Data Adjustment Techniques for Reactor Analysis
 16. REMOTE SYSTEMS TECHNOLOGY—Fred DiLorenzo (208/526-7149)
 \*\*16.1 Remote Waste Packaging and Handling [FCWMD]
 \*\*16.2 Robotics and Advanced Remote Systems for Hot Cells

Remote Handling and Automation in Glove Boxes Large-Area Remote Handling/Robotics Remote Handling/Robotics in Waste Vitrification

Scaling and Uncertainties in Computer Code Predictions

Thermal-Hydraulic Aspects of Passive Safety and New Generation

Thermal Hydraulics of Severe Accidents and Degraded Cores

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Summary required for acceptance and publication in TRANSACTIONS. Full paper required before presentation, to be

16.5 Reflect Handhing Robotics in Analytical Operations
 \*16.7 International and Domestic Remote Technology Development
 17. THERMAL HYDRAULICS--Yassin Hassan (409/845-7090)
 17.1 General Thermal-Hydraulics Modeling and Experiments
 17.2 Thermal-Hydraulics Reactor Systems