RECORD #230

TITLE: Applicability of 10 CFR Part 20 to Occupational Radiation Exposures Resulting from Radon and Radon Progeny at Nuclear Power Plants

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

November 26, 1990

MEMORANDUM FOR: Malcolm R. Knapp, Director, DRSS, Region I
J. Philip Stohr, Director, DRSS, Region II
Charles E. Norelius, Director, DRSS, Region III
A. Bill Beach, Director, DRSS, Region IV
Ross A. Scarano, Director, DRSS, Region V

FROM: Frank J. Congel, Director
Division of Radiation Protection
and Emergency Preparedness
Office of Nuclear Reactor Regulation

SUBJECT: APPLICABILITY OF 10 CFR PART 20 TO OCCUPATIONAL RADIATION EXPOSURES RESULTING FROM RADON AND RADON PROGENY AT NUCLEAR POWER PLANTS

Some time ago Region III asked, informally, if the radon and radon progeny are to be considered when determining whether or not a room, enclosure, or area constitutes an "airborne radioactivity area" as defined in existing 10 CFR 20.203 (d)(1) and revised 10 CFR 20.3. In discussing this request with a member of the RES staff, John Buchanan was told of a July 14, 1988 memorandum (enclosed) from Region V that asked for guidance concerning the applicability of 10 CFR Part 20 requirements to occupational exposures to radon and radon daughters. (Apparently this memorandum was inadvertently overlooked; neither I nor members of my division remember seeing this memorandum until we obtained a copy later from G. Yuhas, Region V.)

Our response, in brief, is that radon and radon progeny resulting from naturally occurring radium or thorium that are present in the soil or in building materials constitute a natural background source of exposure to radiation. Therefore, consistent with the provisions of 10 CFR 20.1(b), such radon and radon progeny at nuclear power plants are not subject to the provisions of 10 CFR Part 20.

The position stated above applies to nuclear power plants and, more generally, to other facilities of NRC licensees that contain no licensed source material that is a source of radon. Where there is a licensed source of radon in the facility, the concentrations of radon and radon progeny from the licensed source usually are indistinguishable in practice from elevated levels of background sources; therefore, for convenience, all radon and radon progeny

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in such facilities may be included in determining the total dose to an individual or the licensee may elect to establish a methodology to distinguish between the contribution from background sources and that from licensed material.

The position stated above has long been the position of the NRC staff; however, this position has not been well documented. The need to clarify the meaning of "natural background" was recognized during the rulemaking process of the major revision of 10 CFR Part 20. As a result, the definition of "background radiation," to which the limits of 10 CFR Part 20 do not apply, includes "...naturally occurring radioactive materials, including radon in concentrations or levels commonly found in structures or the environment;..." Thus the new Part 20 clarifies and continues the position that the Part 20 limits do not apply to radon other than radon arising from licensed source material regulated by the NRC.

For additional technical information on "Radon Daughter Concentrations in a Nuclear Power Plant," see the paper by Thomas J. VanderMay, "Radiation Protection Management Vol. 4, No. 4 (July/August 1987), pp 52-58, which reports the results of radon surveys at one nuclear power plant. Radon daughter concentrations found in this plant under normal ventilation conditions were very similar to concentrations found in a survey of public buildings in a city. However, radon daughter concentrations in closed (poorly ventilated) areas were consistently higher than those in well ventilated areas, as would be expected.

We have coordinated this position with the Division of Regulatory Applications, RES, and the Division of Industrial and Medical Nuclear Safety, NMSS, who have no objections to this position. OGC has no legal objection.

Original signed by Frank J. Congel

Frank J. Congel, Director
Division of Radiation Protection
and Emergency Preparedness
Office of Nuclear Reactor Regulation

Enclosure:
As stated

Record Note: This memorandum has been revised in accordance with the Nov. 20, 1990 memorandum from S.A. Treby, OGC, to L.J. Cunningham, NRR, (attached).

Distribution: See next page

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MEMORANDUM FOR: Frank Congel, Director
Division of Radiation Protection & Emergency Preparedness, NRR

FROM: Ross A. Scarano, Director
Division of Radiation Safety & Safeguards, RV

SUBJECT: INSPECTOR FEEDBACK ON RADON AT NUCLEAR POWER PLANTS

Recently, an inspector in my Division, James Russell, noted that licensee and NRC personnel are occasionally found to be externally contaminated with Radon daughter products after touring or working in certain enclosed areas at nuclear power plants. Such contaminations are attributed to the buildup of Radon and its particulate daughters in the more poorly ventilated plant areas. It is generally well known that massive concrete structures emit and accumulate Radon in enclosed spaces. This can result in levels significantly above external background levels and may result in significant personnel exposures.

The National Council on Radiological Protection recently noted (Ionizing Radiation Exposure of the Population of the United States. Report No. 93, 1987) that exposure to Radon and particulate daughters provides the largest single component of dose equivalent to the public from any source of radiation. This averages about 200 mrem/yr effective whole body dose equivalent per individual and some exposures occur which are up to two orders of magnitude larger, dependent on the structures in which the individual lives and works. A rough estimate seems to indicate the lung dose from occupational exposure could be up to 6 rem per year.

10 CFR 20.1(b) states:

> "The use of radioactive material or other sources of radiation not licensed by the Commission is not subject to the regulations in this part. However, it is the purpose of the regulations in this part to control the possession, use and transfer of licensed material by any licensee in such a manner that the total dose to an individual (including exposures to licensed and unlicensed radioactive material and to other unlicensed sources of radiation, whether in the possession of the licensee or any other person, but not including exposures to radiation from natural background sources or medical diagnosis and therapy) does not exceed the standards of radiation protection prescribed in the regulations in this part."

The Office of Nuclear Material Safety & Safeguards interprets this regulation to require the assessment of concentrations, posting of areas and control of exposures to Radon and particulate daughters in mines and processing facilities when their concentrations are artificially increased by structures and processes above background levels. Pertinent instructions for the control of Radon and particulate daughter exposures are contained in Regulatory Guide 8.30.

It appears possible that significant unmonitored exposures may be occurring at nuclear power plants due to Radon and particulate daughter exposures from artificially increased concentrations and that these could result in exposures in excess of 20.103 levels.

This memorandum provides our observations in accordance with the guidance of Inspection Manual Chapter 0801 and requests that policy guidance be provided to the Regions as to the applicability of 10 CFR 20 requirements for Radon and particulate daughter exposures.

During the May 1988 counterpart meeting, this topic was discussed with Mr. Harold Peterson of the Office of Nuclear Regulatory Research in regard to the pending revision of 10 CFR 20.

Ross A. Scarano, Director
Division of Radiation Safety & Safeguards, RV

cc: Robert Alexander, Chief
Radiation Protection and Health Effects Branch, RES

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YES /NO	YES /NO	YES /NO	YES /NO	YES /NO
				SENDING TO PDR YES /NO
RV/gmd JRussell 6/ 1/88	GYuhas 7/14/88	FWenslawski 7/14/88	RScarano 7/14/88	