UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, DC 20555 - 0001

ACNWR-0224

July 27, 2005

The Honorable Nils J. Diaz
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SUBJECT: RESPONSE TO THE OCCUPATIONAL SAFETY AND HEALTH AGENCY REQUEST FOR INFORMATION ON IONIZING RADIATION

Dear Chairman Diaz:

On May 3, 2005, the Occupational Safety and Health Agency (OSHA) submitted the following request for information in the *Federal Register*:

> OSHA requests data, information and comment on issues related to the increasing use of ionizing radiation in the workplace and potential worker exposure to it. Specifically, OSHA requests data and information about the sources and uses of ionizing radiation in workplaces today, current employee exposure levels, and adverse health effects associated with ionizing radiation exposure. OSHA also requests data and information about practices and programs employers are using to control employee exposure, such as exposure assessment and monitoring methods, control methods, employee training, and medical surveillance. The Agency will use the data and information it receives to determine what action, if any, is necessary to address worker exposure to occupational ionizing radiation.

The Advisory Committee on Nuclear Waste (ACNW or Committee) considered OSHA's request for information (RFI) as published in the *Federal Register* and is providing its independent views on OSHA's RFI.

The Committee notes that many components of a robust system of radiation protection, including radiation protection programs, regulations and regulatory agreements, and other sources of information, already exist:

1. NRC and Agreement States regulations promulgated for activities regulated by the Atomic Energy Act (AEA);

2. State radiation protection programs for non-AEA radioactive materials;

3. Federal guidance on sources of electronic product radiation from the Center for Devices and Radiological Health of the Food and Drug Administration;

4. State programs for electronic product radiation control;

5. U.S. Environmental Protection Agency general applicable radiation protection statutes and related guidance;

6. U.S. Department of Energy radiation protection statutes (10 CFR Part 835, "Occupational Radiation Protection"), regulations, orders, and guidance;

7. Reports of the National Academy of Sciences, including the recent report "Health Risks from Exposure to Low Levels of Ionizing Radiation" Biological Effects of Ionizing Radiation (BEIR) VII - Phase 2, 2005;

8. The Conference of Radiation Control Program Directors (CRCPD) and the Organization of Agreement States (OAS) programs that support Agreement State and non-Agreement State radiation protection programs;

9. The CRCPD and OAS joint letter to OSHA regarding its RFI;

10. NRC data on occupational radiation exposure (NUREG-0713, Volume 25, "Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities," 2003);

11. Nuclear Energy Institute (NEI) data on occupational radiation exposure;

12. Guidance offered by the National Council on Radiation Protection and Measurements (NCRP); and

13. OSHA-NRC Memoranda of Understanding.

This information demonstrates that existing programs provide adequate radiation protection to workers. We have summarized some of the information in the appendix to this letter.

The Committee also believes that the premise of OSHA's request for information that worker exposure might be increasing is not substantiated. For example, the ACNW notes that in Table 3.1 of NUREG-0713 (see the appendix to this letter), the trend in average measurable Total Effective Dose Equivalent (TEDE) per worker has decreased in every one of the six categories of NRC licensees (from 1994 to 2003).

The Committee did not have access to any comprehensive database for radiation dose information for radiation workers in medical areas that use non-AEA radioactive materials or electronic product radiation devices and cannot comment on trends for these workers. The ACNW notes that these workers' groups are monitored under State authority. The 33 Agreement States typically integrate these non-AEA radiation worker monitoring and protection programs into NRC-approved programs. Nonetheless, the ACNW cannot include this radiation worker group in the remaining comments in this letter.

The NEI provided additional analysis to the Committee indicating a clear trend in worker dose reduction in the nuclear power industry for collective dose per reactor and collective dose per megawatt year of operation. The NEI data on average annual number of workers with measurable dose for the period of 1973 - 2003 show a decreasing trend since 1984. The NEI reported that these trends are a result of robust As Low As Reasonably Achievable (ALARA) programs rather than a focus only on strict numerical standards. The ACNW interprets the data to indicate that the current limits, along with the implementation of the ALARA principle, have been effective in providing radiation protection for workers.

While collective dose for Department of Energy (DOE) workers has increased from 2002 - 2003, this increase reflects more work activities rather than an increase for individual workers (DOE/EH-0688, "DOE Occupational Radiation Exposure 2003 Report").

Moreover, the recently released BEIR VII report affirms that cancer risk estimates for exposure to ionizing radiation have not changed significantly from those reported in previous BEIR reports.

In summary, the ACNW believes that existing radiation safety programs and the current regulatory infrastructure promote effective and timely oversight of occupational radiation protection programs required under Federal and State authorities. Furthermore, documented trends in worker exposures do not support the need for a new regulatory initiative. The ACNW recommends that the Commission provide a response to OSHA consistent with this view.

Sincerely,

/RA/

Michael T. Ryan
Chairman

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In summary, the ACNW believes that existing radiation safety programs and the current regulatory infrastructure promote effective and timely oversight of occupational radiation protection programs required under Federal and State authorities. Furthermore, documented trends in worker exposures do not support the need for a new regulatory initiative. The ACNW recommends that the Commission provide a response to OSHA consistent with this view.

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APPENDIX
INFORMATION EVALUATED BY ACNW REGARDING OSHA'S REQUEST FOR INFORMATION (RFI)

NRC Data on Occupational Radiation Exposure

NRC summarizes information regarding worker exposure from its databases for several industry segments. The latest available summaries are provided in NUREG-0713, Volume 25, "Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities." Example data from NUREG-0713 (Table 3.1) are provided below. The table shows the average annual exposure for certain categories of NRC licensees: namely industrial radiography, manufacturing and distribution, low-level waste disposal, independent spent fuel storage, fuel cycle licenses, and commercial light water reactors. The table indicates a downward trend in the collective dose (person-rem) from 1994 to 2003 across the industries measured. This observation further supports ACNW's view that the system of radiation protection is robust and effective; thus, OSHA need not intervene to address worker exposure to occupational ionizing radiation.

Agreement State Programs

In its recent review of the NRC Agreement States program, the ACNW found the radiation program to be robust and effective in providing radiation protection programs for workers regulated under both Atomic Energy Act (AEA) and non-AEA-regulatory authority. ACNW has reported previously on the Integrated Material Performance Evaluation Program (IMPEP), created to oversee and review the Agreement States program. IMPEP results are used to determine the adequacy and compatibility of individual Agreement State programs. In the ACNW's 2005 letter to the Commission, "Status of the Agreement State Program and the Integrated Materials Performance Evaluation Program (IMPEP)," the Committee stated the following:

> Two key factors make the IMPEP program proactive rather than reactive, and risk informed and performance based rather than prescriptive. First, the collaboration of independent Agreement State staff members and NRC's regional materials program staff on review teams provides for consistency among the States and lets them share their results and experiences. This interaction has led to improved risk-informed approaches and procedures. Second, IMPEP ratings and responses use a graded approach with progressively more significant levels of action.
>
> Future inspection frequency and the depth of interaction with Agreement States Program staff are determined by review of a program's performance.
>
> This graded approach allows for effective oversight and identification of Agreement State programs needing attention, so that corrective measures can be implemented before significant problems arise.

TABLE 3.1

Average Annual Exposure Data for Certain Categories of NRC Licensees
1994 - 2003

NRC License Category* and Program Code	Calendar Year	Number of Licensees Reporting	Number of Monitored Individuals	Number of Workers With Measurable TEDE	Collective TEDE (person-rem)	Average TEDE (rem)	Average Measurable TEDE per Worker (rem)
Industrial Radiography	1994	139	2,886	2,007	1,415	0.49	0.71
	1995	149	3,761	2,651	1,443	0.38	0.54
	1996	148	3,766	2,639	1,449	0.38	0.55
03310	1997	148	3,570	2,574	1,356	0.38	0.53
03320	1998	142	4,952	3,446	1,863	0.38	0.54
	1999	132	3,837	2,827	1,551	0.40	0.55
	2000	129	3,368	2,542	1,528	0.45	0.60
	2001	124	3,780	3,161	2,111	0.56	0.67
	2002	100	3,420	2,842	1,729	0.51	0.61
	2003	86	2,649	2,319	1,504	0.57	0.65
Manufacturing and Distribution	1994	44	2,941	1,251	580	0.20	0.46
	1995	36	2,666	1,222	595	0.22	0.49
	1996	38	2,631	1,241	556	0.21	0.45
	1997	33	1,154	665	397	0.34	0.60
02500	1998	31	1,986	654	402	0.20	0.61
03211	1999	39	2,181	836	419	0.19	0.50
03212	2000	39	2,461	1,188	415	0.17	0.35
03214	2001	36	1,862	1,211	351	0.19	0.29
	2002	29	1,437	1,052	328	0.23	0.31
	2003	23	1,849	1,459	394	0.21	0.27
Low-Level Waste Disposal**	1994	2	202	83	22	0.11	0.27
	1995	2	212	56	8	0.04	0.15
	1996	2	165	67	8	0.05	0.12
	1997	2	185	50	5	0.03	0.11
03231	1998	1	27	13	1	0.05	0.10
	1999	0					
Independent Spent Fuel Storage	1994	1	158	89	42	0.27	0.47
	1995	1	104	49	51	0.49	1.04
	1996	1	97	53	54	0.56	1.02
	1997	1	55	24	6	0.11	0.24
23100	1998	1	53	21	3	0.05	0.12
23200	1999	2	86	33	5	0.06	0.16
	2000	2	146	83	6	0.04	0.07
	2001	2	154	107	13	0.08	0.12
	2002	2	75	67	6	0.08	0.09
	2003	2	55	46	3	0.05	0.06
Fuel Cycle Licenses - Fabrication Processing and Uranium Enrich.	1994	8	3,596	2,847	1,147	0.32	0.40
	1995	8	4,106	2,959	1,217	0.30	0.41
	1996	8	4,369	3,061	878	0.20	0.29
	1997	10	11,214	3,910	1,006	0.09	0.26
	1998	10	10,684	3,613	950	0.09	0.26
	1999	9	9,693	3,927	1,020	0.11	0.26
	2000	9	9,336	4,649	1,339	0.14	0.29
21200	2001	9	8,145	3,980	1,162	0.14	0.29
21210	2002	8	7,937	3,886	661	0.08	0.17
	2003	8	7,738	3,633	556	0.07	0.15
Commercial Light Water Reactors***	1994	109	139,390	71,613	21,704	0.16	0.30
	1995	109	132,266	70,821	21,688	0.16	0.31
	1996	109	126,402	68,305	18,883	0.15	0.28
	1997	109	126,781	68,372	17,149	0.14	0.25
41111	1998	105	114,367	57,466	13,187	0.12	0.23
	1999	104	114,154	59,216	13,666	0.12	0.23
	2000	104	110,557	57,233	12,652	0.11	0.22
	2001	104	104,928	52,292	11,109	0.11	0.21
	2002	104	107,900	54,460	12,126	0.11	0.22
	2003	104	109,990	55,967	11,956	0.11	0.21
Grand Totals and Averages	1994	303	149,173	77,890	24,910	0.17	0.32
	1995	305	143,115	77,758	25,003	0.17	0.32
	1996	306	137,430	75,366	21,828	0.16	0.29
	1997	303	142,959	75,595	19,919	0.14	0.26
	1998	290	132,069	65,213	16,406	0.12	0.25
	1999	286	129,951	66,839	16,661	0.13	0.25
	2000	283	125,868	65,695	15,940	0.13	0.24
	2001	275	118,869	60,751	14,746	0.12	0.24
	2002	243	120,769	62,307	14,850	0.12	0.24
	2003	223	122,281	63,424	14,413	0.12	0.23

* These categories consist only of NRC licensees. Agreement State licensed organizations are not required to report occupational exposure data to the NRC.

** As of 1999, there are no longer any NRC licensees involved in this activity. All low-level waste disposal facilities are now located in Agreement States and no longer report to the NRC.

*** Includes all LWRs in commercial operation for a full year for each of the years indicated. Reactor data have been corrected to account for the multiple counting of transient reactor workers (see Section 5).

Environmental Protection Agency (EPA) Radiation Protection Programs and Requirements

The EPA has responsibility for protecting the public with considerable authority for developing radiation protection program guidance and setting environmental standards. The EPA has wide-ranging authority to promote, conduct, or contract research for radiation protection information; to promulgate generally applicable environment standards which limit man-made radioactive materials; to provide technical assistance to the States and other Federal agencies with radiation protection programs; to advise them in the execution of such programs; and to provide emergency assistance in responding to radiological emergencies. While EPA's generally applicable radiation protection standards apply to protection of members of the public, they are coordinated with requirements promulgated by NRC and the States.

Department of Energy (DOE) Radiation Protection Programs and Requirements

The DOE's 10 CFR 835, "Occupational Radiation Protection," provides nuclear safety requirements that, if violated, provide a basis for the assessment of civil and criminal penalties. The DOE has a series of guides, standards, programs, and orders which are consistent with 10 CFR 835. The DOE's Office of Health and Safety establishes comprehensive and integrated programs for the protection of workers from hazards in the workplace, including ionizing radiation. The DOE has standard radiation dose limits which establish maximum permissible doses to workers and members of the public. DOE radiation protection standards are based on EPA 1987 guidance, which in turn is based on recommendations from the International Commission on Radiological Protection (1977) and the National Council on Radiation Protection and Measurements (NCRP) (1987). In addition to the requirement that radiation doses not exceed the limits, contractors are required to maintain ALARA exposures.

According to DOE/EH-0688, "DOE Occupational Radiation Exposure 2003 Report,"

> The change in operational status of DOE facilities has had the largest impact on radiation exposure over the past 5 years due to the shift in mission from production to cleanup activities and the shutdown of certain facilities. For 2003, this resulted in an increase in the collective dose as sites handled more radioactive materials for processing, storage, or shipping.

In this document, DOE also stated that a statistical analysis of data over the past 5 years indicates "that while the collective TEDE, neutron, and extremity dose increased between 2002 to 2003, it does not represent a statistically significant change in the dose received by individual workers at DOE."

Other Data Sources

ACNW considered several databases:

- Specific information related to incidents in Agreement and non-Agreement States was included from the NRC's nuclear materials events database (NMED), *http://www.nmed.inl.gov.*

- State radiation control programs most often integrate regulation and control of ionizing radiation and radioactive material not regulated by NRC under the Atomic Energy Act

(as amended). Sources of information include the Conference of Radiation Control Program Directors (CRCPD) <http://*www.crcpd.org*> and the Organization of Agreement States (OAS) <*http://www.agreementstates.org*>.

- Recent examples of emerging guidance include: the work cosponsored by the Center for Devices and Radiological Health (CDRH) and the Transportation Security Administration (TSA) and performed by the NCRP. This work is reported in the "Presidential Report on Radiation Protection and Advice: Screening of Humans for Security Purposes Using Ionizing Radiation Scanning Systems." The report will be completed and delivered to CDRH this summer. The CDRH intends to use the NCRP recommendations as guidance when considering new performance standards. The CDRH also is working with other government agencies and the American National Standards Institute Committee (ANSI) N43 to identify new consensus standards for cargo and vehicle scanners that use ionizing radiation.

- The National Academy of Sciences recently released its BEIR VII report "Health Risks from Exposure to Low Levels of Ionizing Radiation," which provides an update to health risks related to radiation. The report affirms that current cancer risk estimates have not changed significantly from earlier estimates.

- The 2003 DOE Occupational Radiation Exposure Report provides a summary and analysis of the occupational radiation exposure received by individuals associated with DOE activities.

OSHA-NRC Memoranda of Understanding

There are four Memoranda of Understanding (MOU) between OSHA and NRC.

1. **STD 01-04-001 – STD 1-4.1 OSHA Coverage of Ionizing Radiation Sources Not Covered by the Atomic Energy Act 10-30-1978**. This early memorandum recognizes the U.S. Atomic Energy Commission (AEC) authority to regulate source, by-product, and certain special nuclear materials, and that OSHA's authority to regulate radiation sources does not include those regulated by AEC. It further states that OSHA covers all radiation sources not regulated by AEC, such as X-ray equipment, accelerators, accelerator-produced materials, electron microscopes, betatrons, and some naturally occurring radioactive materials.

2. **CPL 02-00-086 – CPL2.86 – Memorandum of Understanding Between OSHA and NRC**. This memorandum characterizes NRC-licensed nuclear facility hazards into four categories:

- Radiation hazards produced by radioactive materials;

- Chemical hazards produced by radioactive materials;

- Plant conditions which affect the safety of radioactive materials and thus present an increased radiation hazard to workers; and

- Plant conditions which result in occupational hazards, but do not affect the safety of the licensed radioactive materials.

  This MOU delineates the general areas of responsibility of each agency, describes generally the efforts of the agencies to achieve worker protection at facilities licensed by NRC, and provides guidelines for coordination of interface activities between OSHA and NRC. To insure against gaps in the protection of workers and avoid duplication of effort, the MOU acknowledges NRC jurisdiction over the first three hazards and OSHA over the fourth hazard.

3. **Worker Protection at Facilities Licensed by the NRC 11-16-1998**. This MOU describes the efforts of the agencies to achieve worker protection at facilities licensed by NRC and provides guidelines for coordination of interface activities between OSHA and NRC. The accord replaced existing guidelines which had been used to coordinate activities of the two agencies. OSHA will provide NRC information, based on reports of injuries or complaints, about nuclear power plant sites where increased management attention to worker safety is needed. OSHA also will give training in basic chemical and industrial safety to NRC inspection personnel so that they will be able to better identify matters of concern to OSHA in radiological and nuclear inspections. The NRC will provide training in radiation safety to those OSHA and State program personnel who may participate in joint evaluation of safety hazards in some facilities.

4. **Gaseous Diffusion Plant Sites**. The AEA, as amended, created the United States Enrichment Corporation (USEC), to manage and operate the two uranium gaseous diffusion enrichment plants in Paducah, Kentucky, and Piketon, Ohio. The AEA requires USEC to be subject to and comply with the Occupational Safety and Health Act, and with applicable NRC standards for radiological safety and common defense and security. Furthermore, the USEC Privatization Act requires NRC and the OSHA to enter into a memorandum of agreement to coordinate their regulatory programs to assure worker safety, avoid regulatory gaps in the protection of workers, and avoid duplicative regulation.