February 17, 2011

MEMORANDUM TO: Undine Shoop, Chief
Health Physics and Human Performance Branch
Division of Inspection and Regional Support
Office of Nuclear Reactor Regulation

FROM: Richard Conatser, Health Physicist **/RA/**
Health Physics and Human Performance Branch
Division of Inspection and Regional Support
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF JANUARY 20, 2011, CATEGORY 2 PUBLIC MEETING WITH THE NUCLEAR ENERGY INSTITUTE (NEI) and THE ELECTRIC POWER RESEARCH INSTITUTE (EPRI) TO DISCUSS CARBON 14 IN GASEOUS EFFLUENTS FROM POWER REACTORS

On January 20, 2011, a Category 2 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC), the Nuclear Energy Institute (NEI), the Electric Power Research Institute (EPRI), representatives from the nuclear power industry, and members of the public at NRC's Executive Boulevard Building, Room 3-B18, 6003 Executive Boulevard in Rockville, Maryland. The purpose of the meeting was to provide NEI, EPRI and the nuclear power industry representatives an opportunity to discuss their evaluation of the power reactor carbon-14 radioactive release source term.

The meeting followed the agenda. Enclosure 1 contains the meeting minutes, and Enclosure 2 contains the attendee list.

Enclosures:
Enclosure 1 – Meeting Minutes
Enclosure 2 – Attendee List

CONTACT: Richard Conatser, NRR/DIRS
301-415-4039

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DATE	02/17/2011	02/17/2011

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Enclosure 1
Meeting Minutes
Carbon-14 in Radioactive Effluents from Power Reactors

A meeting between NRC, NEI, nuclear utility representatives, and members of the public was held on January 20, 2011 to provide a forum for discussion of carbon-14 (C-14) in effluents from power reactors. The meeting followed the agenda proposed in a Public Meeting Notice (Agencywide Documents Access and Management System (ADAMS) Accession No. ML103540018.)

I. ADMINISTRATIVE

The meeting started with welcome to the participants, and a round of self-introductions, and a opening statement by Richard Conatser, Health Physicist in the Health Physics and Human Performance Branch, Office of Nuclear Reactor Regulation (NRR).

II. DISCUSSION

Richard Conatser, NRC, began the meeting by stating the purpose of the meeting was twofold:

1. Continue and if possible conclude the dialogue begun at the last meeting regarding modeling of C-14 production, and
2. Open the floor to potential new C-14 topics of interest.

He indicated this meeting is a continuation of the NRC public meeting held on 10-Jun-2010. See ML101660405 for a summary of the previous meeting. At that meeting, EPRI presented a proposed methodology to estimate Carbon-14 in gaseous effluents from power reactors based on various production mechanisms, primarily by the activation of Oxygen-17 in reactor water. That EPRI presentation may be found in ADAMS, as ML101650129.

Before proceeding further, Mr. Conatser provided some background and context for those who may not have been present at the last meeting (10-Jun-2010). That introduction is captured below, and it is included in this meeting summary as discussed at the meeting.

> In the late 1970s and early 1980s, licensees were developing their Offsite Dose Calculation Manuals which specified how to calculate doses to members of the public due to radioactive effluents from power reactors. At that time, there was some discussion about (1) which nuclides should be explicitly included in NRC guidance and (2) which nuclides should be included when demonstrating compliance with the regulations. At that time, the NRC generated numerous letters of correspondence and issued several guidance documents to address these two issues. The NRC documents from that period have provided the basis, used by licensees for the last 30 years, for reporting C-14 in nuclear power plant effluents.
>
> Radioactive effluents from nuclear power plants have decreased significantly over the last 30 years. At the same time, the analytical capabilities for measuring

the radionuclides in effluents have improved. These changes have the potential to affect how licensees demonstrate compliance with the following regulations:

- 10 CFR 50.36a requires licensees to report the principal radionuclides in liquid and gaseous effluents.
- 10 CFR 50 Appendix I specifies that actual doses to the public should not be significantly underestimated.

In 2009, the NRC updated the guidance documents for reporting radioactive effluents from nuclear power plants (Regulatory Guide 1.21, Revision 2, ADAMS ML091170109 and Regulatory Guide 4.1, Revision 2, ADAMS ML091310141). The updated guidance documents take into account the substantial reductions in radioactive effluents and the significant improvements in laboratory capabilities over the last 30 years. As a result of the updated NRC guidance, licensees may be taking additional actions for reporting C-14 in radioactive effluents for calendar year 2010.

Although C-14 may appear in some licensees annual effluent reports for 2010, this does not affect the actual amount of C-14 released from these nuclear power plants. Similarly, this will not change the actual doses received by members of the public as a result of exposure to C-14 in nuclear power plant effluents. The outcome will be to improve transparency in reporting effluents from nuclear power plants.

The discussions at this meeting will focus on some of the licensee's efforts to estimate the amount of C-14 released from nuclear power plants in the United States. So now we will continue that discussion about production of C-14 in power reactors. Based on the June 2010 Public Meeting on C-14, the NRC had questions about the selection of neutron energies used in the EPRI calculation methodology. That precipitated significant discussion, and NEI and EPRI personnel indicated they would bring additional information to this meeting.

One of the main objectives of this meeting is to review EPRIs methods for estimating C-14 in power plant effluents and to open a dialogue between the NRC and EPRI reactor physics personnel to gain additional insights into the EPRI method for estimating C-14 in nuclear power plant effluents. The purpose of this meeting is not for NRC to approve the EPRI method. This meeting is just a dialogue. The NRC staff is not setting policy at this meeting, nor is the NRC imposing new requirements on licensees at this meeting.

Ralph Andersen from NEI thanked the NRC for hosting the meeting, and indicated this meeting should be placed in the proper context with regard to Carbon-14. Mr. Andersen stated that his purpose in requesting these meetings on Carbon-14 was to update the NRC on the results of joint NEI/EPRI research into C-14 in effluents from power reactors.

Karen Kim, EPRI, and the principal investigators, Jerry Palino and Henry Helmholz, presented a summary of their newly published Technical Report (EPRI TR 1021106), Estimation of Carbon-

14 in Nuclear Power Plant Gaseous Effluents. This EPRI Technical Report is publicly available from EPRI's web site (EPRI.com). The power point presentation given by EPRI is available on ADAMS as ML110380224. EPRI's calculation methodology is based on the standard equation for activation of materials in the presence of the neutron flux of the reactor core, and includes site specific parameters to account for the major variations between reactor units. EPRI's method for estimating Carbon-14 in power plant effluents was compared to other methods published in the technical literature (e.g., National Council on Radiation Protection Report 81, NRC NUREG-0016 GALE Code, a series of six NRC NUREGs which document measurements of C-14 in effluents of six power reactors, and international experience with C-14 in power plant effluents). EPRI demonstrated their methodology for calculating C-14 in power plant effluents produced results similar to those produced in earlier studies. Karen Kim also indicated that the EPRI method generally predicted slightly higher amounts of C-14 in power plant gaseous effluents than the results of previous studies. EPRI discussed how this provided a technically defensible estimate of C-14 production, and perhaps provided a better basis than use of the default value listed in NRCP Report Number 81, C-14 in the Environment.

III. PUBLIC PARTICIPATION

This was a Category 2 public meeting, with at least one member of the public attending the meeting in person or by teleconference. Opportunities were provided for comment after the break and prior to adjourning the meeting.

Public Meeting Feedback 659 Forms were available. Participants over the teleconference were also provided opportunity to comment using the public meeting feedback form. Meeting was adjourned.

Enclosure 2
Attendance List
Carbon-14 in Radioactive Effluents from Power Reactors
20-Jan-11

Name	Company
Richard Conatser	NRC
Tony Attard	NRC
Manuel Jimenez	NRC
Louis Carson (telephone)	NRC
Steven Schaffer	NRC
George Kuzo (telephone)	NRC
Ralph Andersen	NEI
Karen Kim	EPRI
Sean Bushart (telephone)	EPRI
James Holian	SAIC
Henry Helmholz	NWT Corporation
Jerry Palino	NWT Corporation
Joe Baron	Shaw Associates
Mike Millinor	Progress Energy
Lisa Edwards	EPRI