

# Safety Evaluation Report for the Westinghouse Electric Company Hematite Reconciliation of Amendment 52 Hematite Building Demolition

## **1.0 BACKGROUND:**

The U. S. Nuclear Regulatory Commission (NRC) issued Amendment 52 to the Westinghouse Hematite's License (SNM-00033) on June 30, 2006. This amendment authorized the Westinghouse Electric Company, LLC (WEC) to dismantle and demolish Hematite's former process buildings. WEC had provided information in support of the license amendment which indicated that there was less than 250 grams of uranium-235 ( $^{235}\text{U}$ ) in the process buildings and that the  $^{235}\text{U}$  was dispersed as surface contamination on the interior building walls and floors. Additionally, in documents supporting the demolition, WEC stated that all process equipment had been removed and there was no inventoried special nuclear material (SNM) mass in the process buildings. The NRC Safety Evaluation Report (SER) for Amendment 52 (Agencywide Documents Access and Management System (ADAMS) accession number ML0601280324) stated that,

The NRC staff determined that the licensee is not required to have a criticality accident alarm system for building demolition because the conservative estimate of mass of  $^{235}\text{U}$  in the buildings (i.e., 250 grams  $^{235}\text{U}$ ) is less than the action limit in 10 CFR Part 70.24 (i.e., 700 grams of  $^{235}\text{U}$ ). Thus, NRC staff has determined that the licensee has provided sufficient information to conclude that there is reasonable assurance of safety for NCS during building dismantlement and demolition activities.

On November 11, 2008, while performing surveys within the process buildings to re-verify previous characterizations of residual radiological contamination, WEC identified residual  $^{235}\text{U}$  in former process pipes in excess of the 250 grams noted above. Using a conservative methodology specified by procedure, WEC estimated the mass of  $^{235}\text{U}$  in the pipes at 2,322 grams. Based on additional surveys performed through November 14, 2008, this amount increased to an estimated 2,638 grams of  $^{235}\text{U}$ . The NRC was informed of this estimate during a November 14, 2008, conference call between the Hematite Licensing Manager, the NRC Project Manager, and the NRC Region III Lead Inspector. Following this call, WEC issued a Stop Work Order and limited access to the process buildings. On November 19, 2008, in accordance with Appendix A, Section (b)(1), of Part 70 to Title 10 of the Code of Federal Regulations (10 CFR) WEC notified the NRC Operations Center (Event No. 44668) of the presence of a quantity of  $^{235}\text{U}$  greater than 250 grams in the process buildings. WEC provided the NRC a follow-up report on November 21, 2008 (ADAMS No. ML083500576). In response to the report, the NRC issued Confirmatory Action Letter (CAL) No. 03-08-005 on December 15, 2008 (ADAMS No. ML083510194). The CAL identified specific actions that the licensee committed to implement. The NRC evaluated WEC's implementation of the commitments as described in the CAL during onsite inspections in January 2009. This evaluation was documented in Inspection Report 070-00036/08-02(DNMS), dated July 23, 2009 (ADAMS No. ML092040700). The CAL was amended and re-issued by NRC letter on July 9, 2009 (ADAMS No. ML091900453). The July 9, 2009, addendum was issued following the NRC's June 22, 2009, approval of an exemption from the criticality monitoring requirements of 10 CFR 70.24

(ADAMS No. ML090570909). This exemption permitted WEC to access the process buildings without a criticality monitoring system being in place.

As amended, the CAL contained a provision to allow WEC to temporarily lift the Stop Work Order on all activities associated with the process buildings and to enter the process buildings for the purpose of completing the characterization activities. The characterization activities were described in the Characterization Plan submitted by letter dated December 18, 2008 (ADAMS No. ML090050061). The CAL addendum also required WEC to keep the NRC informed of scheduled characterization activities so that NRC inspectors could be present to observe such activities, as determined by the NRC. The addendum also required WEC to ensure that the internals of the process building remained in their present state and that the Stop Work Order be reinstated at the completion of the characterization activities.

The initial scope of this characterization effort was to survey and estimate  $^{235}\text{U}$  mass in the piping and equipment remaining in the process buildings. The process buildings include six interconnected buildings (i.e., Buildings 240, 253, 254, 255, 256 and 260). During the course of the characterization work, the scope was increased to encompass the building surfaces, including the floors, walls, ceilings and roofs. An analysis of the roof substrate was also performed by WEC. The "*Hematite Decommissioning Project Summary Report of the 2009 Process Building Characterization*" (ADAMS No. ML093000433) describes the radiological surveys and visual inspections that were performed during these characterization activities. The Report also summarizes the mass and areal density estimates that were calculated based on the information obtained from the characterization surveys.

Items re-characterized included the following:

- Piping;
- Ventilation components (e.g., HEPA filter bank housings, ducts, heating/cooling components, etc.);
- Conveyor components in Buildings 256-1 and 256-2;
- Filter shredder components in Building 256-1;
- Filters in Building 260;
- Mixer hopper components in Building 254;
- Blowers and stacks associated with HEPA filter banks; and
- Sink and associated piping in Building 240.

The re-characterization for  $^{235}\text{U}$  revealed an estimated 1770 grams in equipment, main piping and in miscellaneous components. The re-characterization of the building surfaces for  $^{235}\text{U}$  identified approximately 6730 grams on floors, walls and the roof of the process buildings.

Following the submittal of the Re-characterization Summary Report, the NRC issued its second addendum to the WEC CAL (ADAMS No. ML093200176), dated November 13, 2009. This addendum resulted in a new Item 8. Item 8 directed WEC to either request an exemption from 10 CFR Part 70.24(a) demonstrating that accidental criticality alarms are not required, or provide a description of plans to re-install an accidental criticality alarm capability. The NRC indicated that until such time that an exemption from 10 CFR Part 70.24(a) has been issued by the NRC, or an accidental criticality alarm capability has been installed and approved by the NRC, a Stop Work Order will be maintained for the Process Building except to allow entry to conduct the following activities:

- a. Conduct radiological surveys and safety inspections;
- b. Conduct required environmental sampling, including sampling existing wells;
- c. Perform routine maintenance work in the building and on the roof to the extent necessary to maintain the integrity of the facility and ensure the safety of workers; and
- d. If required, install an accidental criticality monitoring system.

To address Item 8, on December 4, 2009, WEC submitted a criticality alarm exemption request (ADAMS No. ML093441396). In response to that request the NRC granted, in part, an exemption on March 17, 2010 (ADAMS No. ML100640138). The exemption was granted for Hematite decontamination and decommissioning activities, but was not granted for building demolition activities. As noted in the cover letter transmitting the exemption, the building demolition aspect would be covered with the resolution of the Amendment 52 issues associated with the increased  $^{235}\text{U}$  and the conditions of the buildings and equipment within the buildings.

On December 16, 2009, WEC submitted a letter (ADAMS No. ML093570277), which included, as an attachment, its assessment of the current validation of Hematite License Amendment 52. The assessment addressed each section of the original Amendment 52 SER and provided WEC's justification for why Amendment 52 and the conclusions presented in the accompanying SER remained valid. On January 27, 2010, WEC submitted two Hematite process building activities safety reports. They were DO-09-003, Revision 0, "*Process Hazards Analysis for the Removal of Equipment and Piping from the HDP Process Building*" and NSA-TR-09-25, Revision 0, "*Nuclear Criticality Safety Assessment of Decontamination and Decommissioning Operation with the Former Process Buildings at the Hematite Site*" (ADAMS No. ML100341241). These reports were submitted in support of activities associated with the removal of selected process building components containing uranium prior to building demolition.

The NRC's assessment of the attachment to WEC's December 16, 2009, submittal was that WEC had neglected to identify the existing conditions in the process building or explain how those conditions differed from the conditions presented in the documents supporting Amendment 52. WEC claimed that the radiological condition of the process buildings had not changed since 2005. In the December 16, 2009, submittal, WEC concluded that the refined characterization data and the minor changes discussed for the process building dismantlement and demolition did not affect the NRC's SER conclusions in areas other than criticality. While it is true that the conditions existing in the process buildings in 2008 are the same as existed when Amendment 52 was issued, the representation of those conditions in 2008 is not the same as it was when Amendment 52 was evaluated by the staff. Increasing the amount of  $^{235}\text{U}$  from a total of 250 grams to a total of over 8,700 grams was certainly a substantial understatement of the conditions of the process buildings. In addition, the equipment remaining in the building and the conditions in the building were certainly different than portrayed in the documents submitted to the NRC for Amendment 52. Therefore, as a result of discussions with the NRC, WEC submitted additional information to the NRC on March 22, 2010 (ML100830643). The purpose of this submittal was to provide additional supporting information to demonstrate that the conclusions in Amendment 52's SER remained valid.

This SER is the NRC staff's assessment of WEC's position that the conclusions, expressed in the NRC's June 2006, SER, remain valid. It is based upon the staff's assessment of WEC's December 16, 2009, and March 22, 2010, submittals.

## **2.0 DISCUSSION:**

### **2.1 WEC's March 22, 2010 Submittal**

WEC's March 22, 2010, submittal included four attachments. Attachment 1, "*Clarification of Amendment 52 Source Documents for Current Building Demolition*," provided clarification of the changes which had evolved from the original assumptions in the Hematite source documents that WEC had used as a basis to justify Amendment 52 to the present day plan for Hematite building demolition. Attachment 2, Technical Basis Document, HDP-TBD-HP-504, Rev. 0, "*Assessment of Conditions During Process Building Demolition*," provided an update to the estimate of potential internal exposure from air emissions and the current potential for external exposure. Attachment 2 also provided an explanation of the engineering and administrative control measures WEC would be using to mitigate potential adverse effects, and Attachment 2 additionally summarized the monitoring plans for the building demolition effort. Attachment 3, Technical Basis Document, HDP-TBD-WM-902, Rev. 0, "*Building Demolition Debris Volume and Weight Estimate*," and Attachment 4, Technical Basis Document, HDPTBD-WM-901, Rev. 0, "*Scaling Factors for Radioactive Waste Associated with the Process Buildings*," were also attached to the March 22, 2010, submittal. They provided the technical basis for certain Attachment 2 input assumptions, including the physical and radiological characteristics of the buildings that were used as input to the exposure estimate.

Associated with the issuance of Amendment 52 in June 2006, WEC had submitted an Environmental Report (ADAMS No. ML042860234), a technical evaluation of building demolition activities (ADAMS No. ML050250347), and the answers to several NRC questions concerning environmental monitoring (ADAMS No. ML060330438) and criticality safety (ADAMS No. ML060800265). In Attachment 1 of the March 22, 2010, submittal WEC described the current differences in the information provided in those documents. Those documents have been revised since 2006. WEC indicated that the revised documents are different than the original documents and that the differences account for the increase in residual SNM described in the 2009 radiological characterization of the process buildings, (ADAMS No. ML0930004331). In Table 1 of Attachment 1, WEC provided on a Section-by-Section basis the differences between the information contained in the original Environmental Report and the current conditions. In Table 2 WEC presented a similar comparison for the Technical Evaluation of Building Demolition. Inconsequential differences were not identified in Attachment 1.

Some of the differences in the revisions to the Environmental Report and to the Technical Evaluation for Building Demolition were common to both documents. They are detailed in Section 2.1.1 of this SER. Those differences which were specific to the Environmental Report are detailed in Section 2.1.2 and those which pertain only to the Technical Evaluation for Building Demolition are in Section 2.1.3. The differences which pertain to the RAIs associated with environmental monitoring are discussed in Section 2.1.4 and those which pertain to criticality safety are discussed in Section 2.1.5.

#### **2.1.1 Commonalities between the Environmental Report and Technical Evaluation for Building Demolition**

While WEC still requests approval for the demolition of all buildings, some buildings may not be demolished prior to decommissioning and some may remain even after license termination. The equipment currently remaining in the process buildings, which will be removed prior to

building demolition, was identified in Table 1-5 of NSA-TR-09-25 in WEC's January 27, 2010, submittal. Attachment 2 of WEC's March 22, 2010, submittal provided a calculation of the potential dose from air emissions due to building demolition based upon the current radionuclide inventory. WEC stated that the results do not alter the previous conclusions regarding air quality impacts associated with the building demolition.

WEC indicated that they intend to perform waste characterization, as appropriate, for waste disposal purposes in accordance with approved procedures. On March 3, 2010, WEC submitted a 10 CFR 20.2002 request for alternate disposal for the radioactively contaminated building rubble material (ADAMS No. ML100700619). If approved, the material would be shipped to the U.S. Ecology facility at Grand View, Idaho which is licensed by the Idaho Department of Environmental Quality. The NRC staff is currently reviewing that request. That request must be found acceptable in order for the material to be sent to U.S. Ecology. If that request is not approved, then WEC will be required to dispose of the radioactive building rubble material at an NRC or an NRC Agreement State licensed waste disposal facility. This SER does not address WEC's 20.2002 alternate disposal request; however, it does cover waste disposal at an NRC or an NRC Agreement State licensed waste disposal facility.

Attachment 2 of the March 22, 2010, submittal provided a calculation of potential dose from air emissions based upon the October 2009, characterization. Attachment 2 also provided detailed calculations for internal and external doses for building demolition. WEC concluded that the calculated dose did not alter previous conclusions regarding air quality or radiological impacts from building demolition.

#### 2.1.2 Aspects only Associated with the Environmental Report

WEC concluded that the description in the Environmental Report of the affected environment associated with the building demolition remained relevant. In the original submittal, no future land use was specified for the Hematite facility. That remains the case at present. The transportation description for the Hematite facility remains valid except that WEC completed installation of a railroad spur in 2009. This spur will permit WEC to transport waste via rail versus via trucks. This is anticipated to result in a reduced transportation impact. The current license restrictions preclude subsurface excavation and slab removal. That restriction remains in effect.

#### 2.1.3 Aspects only Associated with the Technical Evaluation for Building Demolition

Subsequent to the 2004 evaluation for building demolition, WEC submitted further information regarding environmental monitoring. This included a revised environmental monitoring plan during building demolition. In WEC's December 4, 2009, letter, the licensee requested an exemption from the criticality monitoring requirements of 10 CFR 70.24 to include various Hematite activities including building demolition. WEC's request included an evaluation of criticality safety considerations for building demolition taking into account the differences in SNM inventory from that assumed in the June 2006 SER. The conclusion in WEC's December 4, 2009, evaluation was that a criticality accident associated with building demolition was not credible, (i.e., very unlikely to occur). This SER addresses that exemption request with respect to building demolition in light of the increased <sup>235</sup>U in the process building.

#### 2.1.4 Aspects Associated with the Environmental Monitoring & Control RAIs

WEC submitted responses to the NRC's request for additional information in January 2006 (ML060330438), and also provided a revised environmental monitoring plan for building demolition. WEC indicated in Attachment 1 of the March 22, 2010, submittal that the responses and the revised environmental monitoring plan remained applicable with the exception of the amount of increased SNM in the process buildings. WEC stated that the environmental monitoring and control planned for building demolition would remain unaffected by the increased inventory of radiological material in the process building.

#### 2.1.5 Aspects Associated with the March 2, 2006, NRC SNM RAIs

WEC's March 17, 2006, response (ML060800265) to the March 2, 2006, RAIs was relied upon for the NRC staff's input into the June 2006, SER – Section 7, "Nuclear Criticality Safety During Building Dismantlement and Demolition." WEC indicated that they had thoroughly evaluated Section 7 of the SER in the December 16, 2009, WEC submittal. In the NRC's March 17, 2010, letter to WEC, the NRC granted WEC's request for an exemption to the criticality monitoring requirements of 10 CFR 70.24 for various activities, but not for building demolition. The staff's assessment of WEC's request is present in Section 3.4 of this SER.

### **3.0 STAFF ASSESSMENT:**

The NRC staff's June 2006, SER for Amendment 52 included six sections which discussed those areas of staff review which resulted in the conclusion that building demolition at Hematite was acceptable. The staff again reviewed these same areas to determine whether a similar finding could be made with respect to each area such that building demolition would again be found acceptable. The staff's review with respect to each of these same Amendment 52 technical areas is presented below. For each section, this SER presents the conclusions which were presented in the June 2006, SER and follows that presentation with the staff's conclusion based upon the existing site conditions.

#### 3.1 SER Section 4 Radiological Status of Facility

In Section 4 of the June 2006, SER it was stated that the staff had reviewed the Environmental Report for the Building Demolition of the Hematite Facility (ML051310063), the Building Demolition Evaluation Technical Report (ML050250347), and building radiological survey records from an April 24-26, 2006, site visit. The survey records reflected the conditions prior to WEC's application of a fixative to the building surfaces. The June 6, 2006, staff SER concluded that "the remediation activities and radiation control measures proposed by the licensee are appropriate for the type of radioactive material present at the site and that the licensee's waste management practices are appropriate."

The current radiological status of the process buildings is described in the attachment to the October 23, 2009, WEC submittal. This submittal transmitted "*Hematite Decommissioning Project Summary Report of the 2009 Process Building Characterization*" (ML093000433). This attachment provided the levels of <sup>235</sup>U contamination remaining in the process buildings' equipment, piping, and miscellaneous components and on building surfaces.

WEC identified the major isotopes of concern as strontium-90, technetium-99, uranium-234, uranium-235, uranium-238, thorium-230, thorium-232 and neptunium-237. For hard to detect radionuclides, WEC established scaling factors. Information on WEC's use of scaling factors was contained in their Technical Basis Document HDP-TBD-WM-901, "*Scaling Factors for*

*Radioactive Waste Associated with the Process Building*" dated March 22, 2010 (ML100830643).

The staff has determined that WEC has performed adequate characterization for the purpose of building demolition and subsequent transfer of waste to processing and/or disposal at a NRC or an NRC Agreement State licensed facility. However, with respect to transferring the building rubble to an alternate disposal site (i.e., under 10 CFR 20.2002), the existing characterization may be insufficient and additional characterization may be required. In addition, the utilization of surrogates for hard to detect radionuclides may require additional NRC scrutiny of WEC's approach depending upon the dose consequences associated with the building rubble 10 CFR 20.2002 request.

However, based on the staff's review of the above noted documents, which provided updated information of the radiological status of the facility, the NRC staff has determined that the licensee has described the types and activity levels of radioactive contamination in the Westinghouse buildings sufficiently so that the buildings can be demolished.

### 3.2 SER Section 5. Planned Decommissioning Activities

The NRC staff's June 6, 2006, SER concluded that WEC had provided sufficient information that the licensee's planned building dismantlement and demolition activities would be conducted in accordance with NRC requirements. The staff based that conclusion upon their review of the Environmental Report for the Building Demolition of the Hematite Facility (ML051310063) and the Building Demolition Evaluation Technical Report (ML050250347).

Subsequent to identifying more residual special nuclear material (SNM) in 2009, WEC submitted "*Hematite Decommissioning Project Summary Report of the 2009 Process Building Characterization*," dated October 23, 2009 (ML093000433), "*Review of the Technical Basis for NRC Approval of Hematite License Amendment 52 for Building Demolition*," dated December 16, 2009 (ML093570277), "*Hematite Decommissioning Project, Process Building Activities Safety Report*," dated January 27, 2010 (ML100341231), and "*Additional Information Concerning License Amendment 52*," dated March 22, 2010 (ML100830643).

In Section 3.0 of Attachment 1 of the January 27, 2010, submittal, "*Process Hazards Analysis for the Removal of Equipment and Piping from the HDP Process Building*," DO-09-003, WEC presented information which indicated that certain equipment will be decontaminated and left in place while other equipment and piping will be removed and ultimately disposed. Items which will remain in place due to their size or other constraints and that have been identified as containing a significant amount of SNM will be vacuumed to remove as much radioactivity as possible and a fixative will be applied to minimize dispersion when demolition occurs. Equipment and piping that are removed will be prepped for disposal at a low level radioactive burial site. WEC concluded that material destined for disposal as low-level radioactive waste should not require extensive decontamination. In Table 1-5 of Attachment 2, "*NCSA of Decontamination and Decommissioning Operations within the Former Process Buildings*," NSA-TR-09-25, of the same January 27, 2010, submittal, WEC identified equipment which is targeted for removal during decontamination and decommissioning operations. Table 1-6 of that same attachment listed the items which are targeted for decontamination only.

Section 3.0 also included a description of the process hazard analysis that was performed by WEC for the removal of equipment and piping from the process buildings. WEC stated that their

primary objective was to identify hazards associated with the process. Hazards considered included criticality, radiation, industrial workplace, chemical, and fire. Of these potential hazards, nuclear criticality had the highest consequence. Besides the criticality hazard, there was deemed to be a minor radiological hazard associated with the presence of small quantities of uranium oxides in piping and equipment if a release or spill occurred from the piping or equipment. Industrial hazards included working from elevated locations, the use of heavy equipment, and the handling of equipment upon removal.

The NRC staff has determined that WEC has provided sufficient information regarding decommissioning activities to allow the NRC to reaffirm its prior conclusion that the planned demolition activities can be performed in accordance with NRC requirements. WEC has satisfactorily addressed the present situation of increased quantity of  $^{235}\text{U}$  in the process buildings and equipment; equipment and piping which require removal; and the equipment which requires decontamination.

### 3.3 SER Section 6. Health and Safety During Building Dismantlement and Demolition

WEC proposed removing the buildings to grade and leaving the concrete slab or foundation in place. The NRC's June 6, 2006, SER concluded that there would be no significant surface disturbances or any subsurface soil disturbances as a result of building demolition. The staff based these conclusions upon their review of Sections 3, 4, and 5 of the Environmental Report for the Building Demolition of the Hematite Facility and the Building Demolition Evaluation Technical Report.

As noted in Section 3.2 above, WEC submitted two safety reports, the Process Hazard Analysis (PHA) report and the NCSA, as attachments to the January 27, 2010, submittal. In the PHA report, WEC stated that, after equipment removal or decontamination of the process building, some items will remain and fixatives will be applied in selected areas to minimize dispersion of airborne radioactive material during demolition. In Tables 1 and 2, respectively in the PHA, WEC presented the recommendations (action items) from the equipment removal PHA and the process sections (nodes) for the equipment and piping removal. In Section 1.5 of the NCSA report WEC stated that they will remove any uranium oxides holdup using mechanically induced agitation and suction provided by a safe volume vacuum cleaner and the recovered oxides will be transferred to a safe volume container. Following decontamination additional fixative will be applied to prevent dispersion of SNM.

In WEC's January 31, 2006, response to the NRC's Request for Additional Information (ML060330438), WEC stated that after the application of fixatives, they expected less than 250 grams of loose surface contamination of  $\text{UO}_2$ . In WEC's March 22, 2010, submittal they provided an estimate of 8.6 Kg of  $\text{UO}_2$  distributed on surfaces and within equipment. Prior to conducting demolition activities, WEC plans to remove certain components containing approximately 1.1 kg of  $\text{UO}_2$ . Approximately 7.6 Kg of  $\text{UO}_2$  will remain distributed on surfaces and equipment at the time of demolition. WEC presented information which concluded that their radiological characterization shows that the additional amount of  $^{235}\text{U}$  poses no significant adverse consequences in terms of nuclear critical safety, radiation protection, occupational safety or environmental protection.

WEC's January 27, 2010, submittal stated that the appropriate personal protective equipment (PPE) would be utilized by workers during demolition activities to prevent exposure to chemicals. In Section 5 of Attachment 2 of WEC's March 22, 2010, submittal WEC described

how engineering and administrative controls will be used to reduce the potential for air emissions. Water sprays, as needed, will be used to wet down concrete blocks and reinforced concrete walls prior to and during demolition and when handling building rubble debris to reduce particulates from air. WEC has established action levels, both quantitative and qualitative, to define the point at which work activities must be adjusted and corrective measures taken to ensure that air emissions are not exceeding regulatory limits. In addition to the stationary environmental monitoring locations, other air monitoring stations in the breathing zone, general area, and at additional downward perimeter locations will collect air monitoring data to provide a timely assessment of airborne activity levels and to assess the engineering and process controls. This data will be utilized by WEC as the basis for adjusting controls and work practices to ensure radiation exposures are maintained As Low As Reasonably Achievable (ALARA).

In WEC's January 31, 2006, response to the NRC's December 23, 2005, RAIs, WEC stated that they will ensure the effluent limitations, monitoring requirements, monitoring locations, frequencies and types of samples will be in accordance with Hematite's license requirements. WEC also stated that Hematite's air effluent control limits are set at 10% of the applicable 10 CFR Part 20 limit which equates to 10 mrem/year and that this limitation would still apply to the process building demolition activities. In Section 6 of Attachment 2 of the March 22, 2010, WEC submittal, an estimate of airborne emissions from demolition of the process building was provided. WEC indicated that the estimates of offsite air concentrations were well below the 10 CFR Part 20, Appendix B, Air Effluent Limit values. WEC also provided radiation dose estimates to the maximum exposed individual located 250 m NW of the Hematite site. These estimates covered both the expected exposure duration and continuous exposure for the anticipated duration of site activities. WEC's estimates were below the 10 mrem/yr maximum total effective dose equivalent limit provided in 10 CFR 20.1101 (d) on air emissions to the individual member of the public. The NRC staff reviewed the assumptions and agreed with WEC's assumptions utilized in their dose estimates.

Based on the NRC staff's review of the health and safety information provided by WEC, the NRC staff has concluded the additional quantity of enriched uranium identified in the process building does not alter the conclusion reached by the staff in the June 2006, SER. The planned demolition activities can be performed in a safe manner in accordance with the NRC requirements for effluent limitations and occupational and public exposures.

#### 3.4 SER Section 7. Nuclear Criticality Safety During Building Dismantlement and Demolition

The NRC's June 6, 2006, SER concluded that WEC had provided sufficient information that there is reasonable assurance of Nuclear Criticality Safety (NCS) during building dismantlement and demolition activities. The staff based these conclusions upon the nuclear criticality safety information in the Building Demolition Evaluation Technical Report and WEC's response (ML060800265) to the NRC's March 2, 2006, RAIs on NCS during building dismantlement and demolition.

WEC's December 16, 2009, submittal evaluated this section of the SER. In the NRC's March 17, 2010, letter to WEC, the NRC granted WEC an exemption request from the requirements of 10 CFR 70.17(a) for a criticality monitoring system in accordance with 10 CFR 70.24(a). However, the criticality monitoring system exemption request was limited to the current quiescent condition and the decontamination and dismantlement (D&D) operations in the process buildings. The exemption did not include building demolition and other site areas

and activities. Therefore, in the March 22, 2010, submittal, WEC reiterated its request for a criticality monitoring system exemption for building demolition and other site areas and activities.

WEC submitted the results of their re-characterization of the process building to the NRC in their report entitled "*Hematite Decommissioning Project Summary Report of the 2009 Process Building*." In WEC's December 4, 2009, 10 CFR 70.24 criticality monitoring exemption request, they provided a summary of the results of the re-characterization of the process buildings during building demolition. In the re-characterization report, the average area density for all building surfaces was determined to be  $0.118 \text{ g }^{235}\text{U}/\text{ft}^2$  and the peak areal density for any building surface was determined to be  $2.1 \text{ g }^{235}\text{U}/\text{ft}^2$ . WEC also noted that this bounding peak areal density for the building surfaces ( $2.1 \text{ g }^{235}\text{U}/\text{ft}^2$ ) is more than two orders of magnitude lower than the bounding maximum subcritical limit for highly enriched uranium ( $325 \text{ g }^{235}\text{U}/\text{ft}^2$ ). WEC further determined that for the building debris, the bounding average and peak  $^{235}\text{U}$  concentration values were  $0.12 \text{ g }^{235}\text{U}/\text{ft}^3$  and  $6.3 \text{ g }^{235}\text{U}/\text{ft}^3$ , respectively, based on a building surface substrate depth of four inches.

An NRC-sponsored study (NUREG/CR-6505, Vol.1, "*The Potential for Criticality Following Disposal of Uranium at Low-Level Waste Facilities*," June 1997), evaluated the potential for hydrogeochemical processes to concentrate uranium to permit nuclear criticality. The NUREG identified a combination of variables that may lead to or support criticality in a waste matrix (or "soil"). The variables included the composition of the soil (i.e., concrete debris, iron scrap, etc.), the enrichments, the density of the soil, the degree of neutron moderation, and the degree of neutron reflection, to name a few. Using data from NUREG/CR-6505, the minimum critical infinite sea concentration for a fictitious bounding medium consisting of  $\text{SiO}_2$  and  $^{235}\text{U}$  (highly enriched) was  $1.4 \text{ g }^{235}\text{U}/\text{L}$  ( $39.6 \text{ g }^{235}\text{U}/\text{ft}^3$ ). WEC determined that based on the concentration of  $^{235}\text{U}$  associated with the building debris being a factor of 330 smaller than the minimum criticality limit, the demolition of the former process buildings could not result in a criticality accident. WEC also noted that additional conservatisms in their assessment precluded a criticality event. These conservatisms included using the average and peak maximum areal densities for the roof (as opposed to the walls which have smaller values); basing the minimum critical concentration limit on  $\text{SiO}_2$  (which has a smaller neutron cross section compared to concrete and steel which would be the predominate building debris); and deriving the minimal critical concentration limit for highly enriched uranium (the limit for low enriched uranium would be considerably greater).

The NRC staff has determined that, based on: (1) the large dispersal area of the remaining  $^{235}\text{U}$  in the process buildings; and (2) the bounding peak  $^{235}\text{U}$  concentration value being significantly smaller than the minimum critical infinite sea concentration; the staff has reasonable assurance that a criticality accident will not occur and, therefore, the licensee's request to demolish the process buildings and the request for an exemption to criticality monitoring requirements of 10 CFR 70.24 is acceptable.

### 3.5 SER Section 8. Environmental Monitoring and Control Program

The NRC's June 6, 2006, SER concluded that WEC has provided sufficient information on its environmental ALARA, its effluent monitoring program, and its effluent control program to demonstrate compliance with 10 CFR Part 20. The staff based these conclusions upon Section 6.0 of the Environmental Report for the Building Demolition of the Hematite Facility the Building Demolition Evaluation Technical Report DO-05-001, Rev 0, "*Environmental Report for Hematite*

*Site Decommissioning,*” and WEC’s responses to RAIs on environmental monitoring and control.

In Section 6 of Attachment 2 of the March 22, 2010, WEC submittal, WEC stated that they will perform workplace air sampling in accordance with 10 CFR 20.1501 and take appropriate work controls so radiation exposure and radiological effluents are ALARA.

With respect to the activities in the process building involving removal of equipment and piping, WEC concluded in Section 3.2 of the PHA that the nature of the work and the packaging plans, all of which are to occur within the process building or adjacent to the process building, would negate any significant environmental concerns since any material released would remain within a confined area and within the process building.

In Table 1 of Attachment 1 to the March 22, 2010, WEC submittal WEC indicated that the Environmental Measurements and Monitoring Programs would remain the same as they were in the original Environmental Report in support of Amendment 52. Therefore, the NRC staff first reviewed Section 6 of the Environmental Report to determine the effectiveness of WEC’s proposed environmental monitoring program considering the increased building content of <sup>235</sup>U. The staff concluded that the information contained in Section 6 did not provide any detail concerning the environmental monitoring that WEC would be conducting. Next, the staff then reviewed WEC’s January 31, 2006, response to staff RAIs concerning the Hematite Environmental Monitoring Plan. In the January 2006 submittal, which was in response to NRC’s request for additional information to support their technical review of process building amendment request, WEC indicated that the Environmental Monitoring Plan had been augmented to account for building demolition activities. In response to a question as to how WEC would use the Environmental Radiation Monitoring Program to demonstrate that NRC dose limits would be met, WEC stated that they will demonstrate compliance with NRC dose limits to members of the public by continued weekly review of the permanent environmental air samples and daily review of the work control air samplers as described in Sections 5.3 and 6.1 of WEC Hematite Environmental Monitoring Plan (ML060330438).

WEC’s January 31, 2006, submittal also stated that WEC would use several industry accepted dust suppression techniques to minimize exposure to personnel, public and environment. Westinghouse further stated that the Environmental Monitoring Program and procedures have control limits typically set at 10% of the regulatory limit. In Attachment 1 of the March 22, 2010, WEC submittal, they indicated that these commitments remained unchanged under the present circumstances.

Since, these samplings are the same as was approved in the Amendment 52 SER and since the increased <sup>235</sup>U and the conditions of the remaining equipment, components, and building are judged not to affect the environmental sampling and monitoring, the NRC staff has concluded that the building demolition environmental monitoring plan remains valid.

### 3.6 SER Section 9. Radioactive Waste Management Program

The NRC’s June 6, 2006, SER concluded that WEC’s programs for the management of radioactive waste generated during building dismantlement and demolition activities ensure that the waste will be managed in accordance with NRC requirements and in a manner that is protective of the public health and safety. The staff based these conclusions upon Sections 3

and 4 of the Environmental Report for the Building Demolition of the Hematite Facility (ML051310063) and the Building Demolition Evaluation Technical Report (ML050250347).

In an attachment (PO-EM-001) to WEC's January 31, 2006, submittal (ML060330438), WEC provided an updated Environmental Monitoring Program to account for the process buildings demolition activities. In that submittal it stated that WEC will use industry accepted dust suppression techniques to minimize personnel exposure to airborne particulates. In Attachment 1 of the January 27, 2010, WEC submittal, it was indicated that WEC will decontaminate large components, equipment, and pipes by removing radioactive material to the extent possible primarily using vacuum systems. Following this decontamination, a fixative will be applied to prevent dispersion of radioactive materials during later operations. WEC also stated that contaminated components and building debris will be disposed as Low Level Radioactive Waste in accordance with the Federal and State disposal requirements. In the March 22, 2010, submittal WEC described use of engineering controls such as a non-toxic chemical lockdown agent and water application. Additionally, WEC indicated that they would cover stockpiled materials or lay down areas with plastic sheeting or tarps and adopt administrative controls to minimize and control fugitive dust emission.

In Attachment 3 of the March 22, 2010, WEC submittal, WEC provided the basis for the volume and weight of the buildings to be demolished. In Attachment 4 of that same submittal WEC identified  $^{90}\text{Sr}$ ,  $^{99}\text{Tc}$ ,  $^{234}\text{U}$ ,  $^{235}\text{U}$ ,  $^{238}\text{U}$ ,  $^{230}\text{Th}$ ,  $^{232}\text{Th}$ , and  $^{237}\text{Np}$  as major isotopes of concern. In Attachment 4 WEC provided scaling factors for radioactive waste associated with the process buildings. WEC will use these scaling factors to calculate the hard to detect isotopes originating from the process building demolition rubble. As noted in Section 3.1 above, the NRC has concluded that WEC has performed adequate characterization for the purpose of process buildings demolition and subsequent transfer of waste to processing and/or disposal at a NRC licensed facility. However, with respect to transferring the building rubble to an alternate disposal site (i.e., 10 CFR 20.2002), the existing characterization may be insufficient and additional characterization may be required of WEC. In addition, for disposal at a non-NRC licensed facility, the utilization of surrogates for hard-to-detect radionuclides may require additional NRC scrutiny depending upon the dose consequences associated with the building rubble 10 CFR 20.2002 request.

The NRC staff is currently assessing a 10 CFR 20.2002 alternate disposal request submitted by WEC. This request must be found acceptable to NRC in order for the waste to be sent to U.S. Ecology. If it is not approved, WEC will need to dispose of the building rubble waste at an authorized low level waste disposal facility.

In an August 6, 2010, NRC email (ML103050094), the NRC transmitted two RAIs to WEC regarding the building demolition. The first indicated that WEC has provided insufficient information on the manner in which building rubble debris will be characterized for waste disposal purposes. The second involved the manner in which WEC would prevent the spread of radioactive contamination in the interval between demolition of the buildings and transfer of building debris to the burial facility. WEC provided responses to the two RAIs in an August 11, 2009, email (ML103050116). WEC supplemented their response to the second RAI in a September 15, 2010, email (ML103050138). WEC's response to the first RAI indicated that WEC would perform waste segregation based on the waste acceptance criteria requirements associated with the authorized waste facility selected for the receipt and/or processing and /or disposal of the waste. This was satisfactory to the staff. WEC's response to the second RAI indicated that "*in general*, Westinghouse plans to proceed directly from building demolition to

waste packaging for transfer to processing and/or disposal. Material handling, staging and packaging will be performed within properly posted and controlled areas.” In WEC’s August response they indicated that they intend to load the majority of the building demolition waste directly into containers for transport to the waste processing facility. WEC considered this approach most appropriate since it minimizes the handling and hazards.

WEC indicated that the statement from Attachment 2 of the March 22, 2010, submittal about the controls that will be imposed during "any extended period of inactivity" was only intended to describe the controls that would be imposed if such a period were to occur. WEC was not implying that it was their intent that there be an extended period of inactivity. WEC indicated that the period of inactivity would be the period of time from when this waste is placed into a covered stockpile (provided that a container is not at-hand as planned) until an adequate amount of waste has been accumulated to comprise a shipment to the disposal facility. WEC also identified situations where covering unpackaged waste may be necessary for reasons that cannot be predicted (e.g., extreme weather, or equipment breakdown). WEC stated that the practice of covering waste referenced in Section 5.1.3 of Attachment 2 was intended to account for these atypical circumstances.

WEC stated that waste will be stored in a contaminated area and any surface water run-off controlled. Surface water run-off resulting from precipitation will be collected to prevent the spread of contamination to non-contaminated areas. The perimeter of the contaminated areas will be sloped inward or curbed to contain and direct potentially contaminated surface water to sumps or other low low-lying areas that will be used as collection points within the contaminated area. From there, the water will be pumped to a holding tank for sampling and/or treatment and discharge.

In anticipation of Decommissioning Plan (DP) approval, WEC has installed a water treatment system which will be operable for building demolition. The water treatment system has a capacity equivalent to the amount of precipitation that could be expected during a 25-year rainfall event. To reduce the amount of surface water run-on into contaminated areas (which would create additional water requiring collection and processing), WEC indicated that diversion features (e.g., curbs) will be constructed at up-gradient locations to direct precipitation around contaminated areas.

In the September 15, 2010, supplemental WEC response, they stated that they will not begin the building demolition prior to finalizing contracts with a duly authorized waste processing and/or disposal facility. In addition, WEC indicated that they did not intend to store building debris for an extended period of time or to delay waste shipment. WEC also provided the clarification that the licensing action for building demolition is not dependent on the request for alternate waste disposal and that a delay in authorization of the alternate disposal request would not necessarily result in storage of waste awaiting disposal since other disposal options exist.

The NRC has concluded that the programs proposed by WEC for the management of the radioactive waste generated during the process building demolition activities will ensure that the waste will be managed in accordance with NRC requirements.

#### **4.0 Environmental Assessment:**

No environmental assessment is required in connection with the resolution of Amendment 52 or the exemption to criticality monitoring requirements of 10 CFR 70.24(a). Both actions pertain to a fuel cycle facility licensed under 10 CFR Part 70 and are administrative or procedural in nature or relate to a change in process operations or equipment where: (i) there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite; (ii) there is no significant increase in individual or cumulative occupational radiation exposure; (iii) there is no significant construction impacts; and (iv) there is no significant increase in the potential for or consequences from radiological accidents. Accordingly, this action falls within a class that is categorically excluded from further environmental review, pursuant to 10 CFR 51.22(c)(11). The NRC staff finds that there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite and there is no significant increase in individual or cumulative occupational radiation exposure. Furthermore, the exemption request is also categorically excluded from further environmental review under 10 CFR 51.22(c)(25).

#### **5.0 CONCLUSIONS:**

The NRC staff has re-evaluated the SER associated with the issuance of Hematite Amendment 52 in view of the increased  $^{235}\text{U}$  in the process buildings and the differing states of equipment and components and the buildings from that portrayed in the WEC documents submitted in support of Amendment 52. The NRC's review consisted of an assessment of the various WEC documents submitted in 2009 and 2010 and WEC's premise that the conclusions reached by the NRC in their June 2006 SER remain valid. The NRC's review also consisted of an assessment of WEC's December 4, 2009 request for an exemption from the criticality alarm monitoring requirements of 10 CFR 70.24(a). Based on the NRC's re-assessment, as described above, the NRC staff has concluded that building demolition can occur at the Hematite facility. The NRC has also found that an exemption from the requirements of 10 CFR 70.24(a) is appropriate.