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Eagle Rock Enrichment Facility Mandatory Hearing on Environmental Matters

July 12-14, 2011

NRC Staff Presentation Topic 5

Radiological Effluent Monitoring Program (REMP)

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Topic 5 (a) – (c)

Presenter:

Karl Fischer, CHP
Environmental Systems Engineer
Environmental Science Division
Argonne National Laboratory

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Clarifications

- FEIS uses “REMP” acronym for “Radiological **Environmental** Monitoring Program.”
  - To ensure Board’s request is fully addressed, staff ‘s presentation focuses on both radiological **effluent** monitoring and radiological **environmental** monitoring.

- Sufficiency/adequacy of AES radiological effluent and environmental monitoring program evaluated in staff’s safety review in Safety Evaluation Report (NRC000032 at 9-8 to 9-13), not as part of environmental review and FEIS.

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Clarifications (cont.)

- Radiological effluent and environmental monitoring plans not required for “off normal” operation.
  - Data from the program during normal operations provides baseline should an accident or other extreme event occur
  - Coordination with external agencies (e.g., Bonneville County) would occur to monitor and address contamination external to EREF site, as identified in AES’s Emergency Plan

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NRC Guidance for Radiological Monitoring Program

- NUREG-1748 – *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs* (NRC000189 at 5-26, 6-30)
  - Identifies information to be provided in the EIS and ER on radiological monitoring program
- NUREG-1520 – *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility* (NRC000031 at 9-12 to 9-15)
  - Provides radiological monitoring program acceptance criteria for NRC staff's safety review:
    - 14 criteria for effluent monitoring
    - 9 criteria for environmental monitoring

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Additional NRC Guidance on Radiological Monitoring

- RG 4.15 – *Quality Assurance for Radiological Monitoring Programs – Effluent Streams and the Environment* (NRC000208)
- RG 4.16 – *Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluent from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants* (NRC000209)
- NUREG-1302 – *Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for BWRs* (NRC000210 at 39-42, 46-49, 59-66, 70-72, 83, and 87-91)

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Radiological Monitoring: Basic Program Elements

- Effluent Monitoring Program (EMP)
  - Addresses monitoring, recording, and reporting of data for radiological contaminants emitted from specific points at the EREF
- Radiological Environmental Monitoring Program (REMP)
  - Addresses monitoring of general environmental media (soil, sediment, groundwater, biota, ambient air) within and outside EREF property boundary

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Radiological Monitoring Applicability

Phase	Effluent Monitoring Program (EMP)	Radiological Environmental Monitoring Program (REMP)
Preconstruction	Not Applicable – No radioactive material present onsite	Not Applicable – No radioactive material present onsite
Construction	Not Applicable – No radioactive material associated with construction	Baseline monitoring starts approx. 2 years prior to onsite presence of radioactive material and operations[a]
Operations	Program active (includes pre-operational testing)	Program active (includes pre-operational testing)
Decommissioning	To be specified in Decommissioning Plan	To be specified in Decommissioning Plan

[a] Monitoring is not directly associated with construction activities.

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Radiological Effluent Monitoring Overview

Sources: NRC000134 at 6-1; AES000070 at 6.1-1 to 6.1-2

- Based on model program in NUREG-1302; confirm effectiveness of effluent controls and verify that operations have no detrimental radiological impact
- Continuous sampling at all release points for airborne and liquid effluents
- No direct discharge of industrial liquid effluents to surface waters or ground
- Semiannual reporting to NRC
- Modified as necessary to maintain collection and reliability of data based on changes to regulatory requirements or facility operations

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Monitored Effluents

- 9 airborne discharge points
  - Gaseous Effluent Ventilation Systems (6)
  - Centrifuge Test and Post Mortem Facility exhaust
  - Heating, ventilation, and air conditioning systems (2)
- Continuous alpha and HF monitoring at all points

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Monitored Effluents

- No discharge of industrial liquid effluents to natural surface waters or to the ground
  - Liquid process effluents collected by the Liquid Effluent Collection and Treatment System
  - Effluent released to atmosphere only by evaporation
  - Cylinder storage pad retention basins would be lined to prevent infiltration and have no discharge outlets
- No facility connection to a Publicly Owned Treatment Works

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Effluent Monitoring Summary

Source: NRC000134 at 6-2 to 6-8

Sample Location	Type	Analysis/ frequency
Separations Building GEVS TSB GEVS TSB Contaminated Area HVAC System Centrifuge Test and Post Mortem Facilities GEVS and Exhaust Filtration System Ventilated Room HVAC Systems exhaust	Continuous air particulate filter	Weekly gross alpha/beta; quarterly isotopic composite
Evaporator	Continuous liquid condensate	
Process Areas	Local area continuous air particulate filter	
Non-Process Areas		

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Cylinder Monitoring and Management

- Capture, retain, and monitor storage pad stormwater runoff (and basin sediment) (AES000070 at 4.13-6 and 6.1-5)
- Monitor external (direct) radiation exposure using TLDs placed along fence line (AES000070 at 6.1-7)
- Implement cylinder management program (AES000070 at 4.13-4 to 4.13-6)
  - Routine inspection and maintenance of cylinder anticorrosion layer has been shown to limit exterior corrosion or mechanical damage
  - Inspect for damage and survey for external contamination prior to placement of cylinders on the storage pad or offsite transport
  - Annual inspection for damage and surface defects

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Environmental Monitoring Overview

- Provides supplemental check of containment and effluent controls
- Focuses on locations within 3 miles of the EREF, but may include more distant control locations
- Initiated about two years prior to startup (and arrival of UF_6) to establish background and baseline data
- Based on model program in NUREG-1302
- Semiannual reporting to NRC

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Environmental Monitoring Components

- Airborne particulate monitoring
  - At least 5 monitored locations (three site boundary, one nearby community, one control)
  - Biweekly gross alpha/beta analysis
  - Quarterly isotopic analysis on composite sample

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Environmental Monitoring Components (cont.)

- Groundwater monitoring
  - Monitoring wells at 8 locations based on direction of groundwater flow under facility
  - Two deep aquifer wells installed after startup
  - Downgradient well to monitor unexpected leakage from retention basins
  - Semiannual isotopic analysis

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Environmental Monitoring Components (cont.)

- Stormwater and basin sediment
  - No discharge from the Site Stormwater Detention Basin under normal operations
  - No significant releases of uranic material are expected from the Site Stormwater Detention Basin
  - Cylinder Storage Pad Stormwater Retention Basins would be lined to prevent infiltration and have no outlets
  - Semiannual isotopic analysis
  - Cylinder storage pad retention basin also receives treated domestic sanitary sewage

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Environmental Monitoring Components (cont.)

- Treated domestic sanitary sewage
  - Semiannual isotopic analysis
  - Monitored before release to Cylinder Storage Pad Retention Basins, and again through stormwater/basin sampling

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Environmental Monitoring Components (cont.)

- Soil and vegetation
  - Baseline samples collected from same vicinity, in each sector at locations near fenceline
  - Operation samples collected in 8 sector locations (including the three with highest concentrations) and one offsite control
  - Semiannual isotopic analysis

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Environmental Monitoring Components (cont.)

- Direct exposure (ground and airborne plume)
  - Assess offsite dose from stored cylinders and facility operations
  - Thermoluminescent dosimeters (TLDs) deployed quarterly at fenceline in all 16 meteorological sectors
  - Two offsite control TLDs

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Environmental Monitoring Summary

Source: NRC000134 at 6-6 to 6-10

Sample Type	Minimum Locations	Minimum analysis/frequency
Continuous airborne particulate	5 fenceline	Biweekly gross alpha/beta; quarterly isotopic
Groundwater	10 wells	Semiannual isotopic
Soil	9	
Vegetation		
Stormwater and basin sediment	3 (one each basin)	Quarterly isotopic
Treated domestic sanitary sewage	1	Semiannual isotopic
TLD	18	Quarterly gamma/neutron

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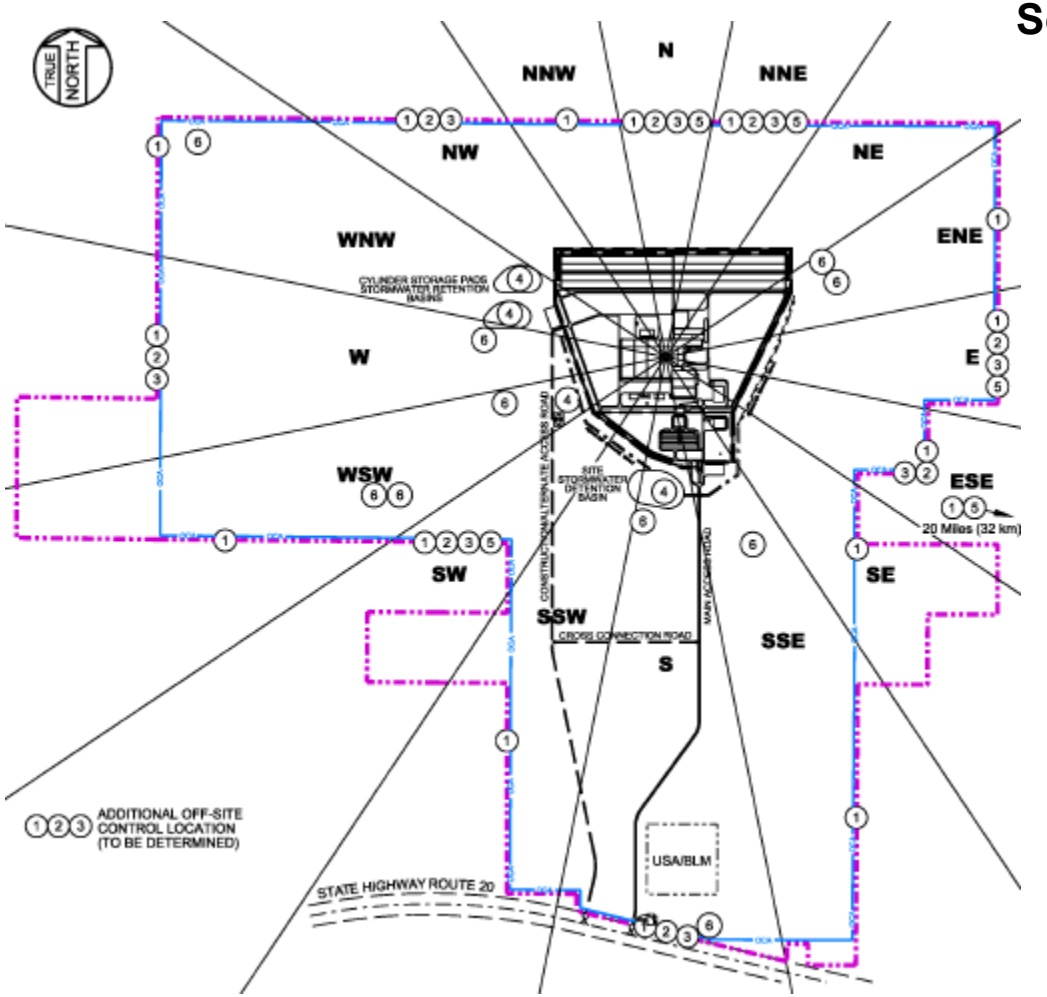
Environmental Monitoring Locations

Source: NRC000134 at 6-3



1. THERMOLUMINESCENT DOSIMETER
2. SOIL SAMPLE
3. VEGETATION SAMPLE
4. WATER SAMPLE / SEDIMENT SAMPLE
5. CONTINUOUS AIRBORNE PARTICULATE SAMPLE
6. GROUNDWATER WELL SAMPLE

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Minimum Detectable Concentrations for Radiological Monitoring

Source: NRC000134 at 6-5 to 6-9; AES000070 at Section 6.1.2

- Minimum detectable concentrations (MDCs) in gaseous effluent and evaporator condensate will be 5% or less of the limit for any applicable uranium isotope
- Other MDCs are selected to ensure that sampling and analytical methods are sensitive enough to support action levels

Media	Analysis	MDC (Bq/g or Bq/ml)
Air	Gross alpha	7.4×10^{-10}
Groundwater	Isotopic uranium	1.1×10^{-4}
Vegetation	Isotopic uranium	1.9×10^{-4}
Soil and sediment	Isotopic uranium	1.1×10^{-2}

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FEIS-Related Review of Radiological Monitoring Program

Staff ascertained that the following radiological monitoring information was presented in the ER, as outlined in NUREG-1748 (NRC000189 at 6-30):

- Maps or aerial photographs of the site with proposed monitoring and sampling locations clearly identified along with effluent release points
- Principal radiological exposure pathways
- Location and characteristics of radiation sources and radioactive effluents (liquid and gaseous)

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FEIS-Related Review of Radiological Monitoring Program (cont.)

Staff ascertained that the following radiological monitoring information was presented in the ER, as outlined in NUREG-1748 (NRC000189 at 6-30):

- Detailed description of the monitoring program including:
  - Number and location of sample collection points, measuring devices used, and pathway sampled or measured
  - Sample size, sample collection frequency, and sampling duration
  - Method and frequency of analysis including lower limits of detection
- Discussion justifying the choice of sample locations, analyses, frequencies, durations, sizes, and lower limits of detection
- Quality assurance procedures.

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Formation of UF_4 Hydrate Plugs to Seal Cylinder Leaks

Source: NRC000211

- When UF_6 cylinders are breached, moist air reacts with exposed UF_6 and iron, forming a dense plug of UF_4 and iron fluoride hydrates that prevents rapid loss of cylinder material.

- Experience is based on eight breached cylinders at three DOE storage sites through 1998 (five initiated by mechanical damage during stacking, two caused by external corrosion from ground contact, and one during maintenance operations).

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Topic 5(d)

Presenter:

Deborah A. Seymour
Branch Chief
Region II Center for Construction Inspection
Division of Construction Projects
Construction Projects Branch 1

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Radiological Monitoring Program Inspection Objectives

To determine whether:

- AES has implemented its monitoring program in compliance with NRC regulations and license requirements for:
  - Processing of radioactive liquid and airborne effluents
  - Control of radioactive liquid and airborne effluents
  - Release of radioactive liquid and airborne effluents
  - Environmental sampling, e.g., soil, vegetation, and air samples, and radiation dosimeters
  - Reporting of information to the NRC with regard to the above
- The program will ensure that releases of radioactivity minimally impact the public and the environment
- AES has implemented adequate management controls for the program

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NRC Inspection Procedure 88045

IP 88045, Effluent Control and Environmental Protection (NRC000212), areas of emphasis:

- Management Controls, including responsibilities and internal audits and inspections
- Quality control of analytical measurements
- Monitoring stations and sampling locations
- Liquid and airborne effluent monitoring instruments
- Records and reports of and radioactive effluent and environmental monitoring
- Radioactive liquid and airborne effluents procedures and license requirements
- Identification and resolution of problems
- Changes to the program, if needed

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Documentation of Inspection Results

The results of the NRC's inspections will be documented in inspection reports that will be available to the public in ADAMS.

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Implementation of NRC Inspections for Radiological Monitoring Program

- NRC inspections begin approximately one year prior to:
  - Receipt of special nuclear material onsite
  - Hot acceptance testing
- Inspections will:
  - Focus on those portions of radiological monitoring program needed for scheduled activities
  - Verify effective implementation of monitoring program
- Significant inspection findings could impact EREF's receipt of special nuclear material or conduct of hot acceptance testing.

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Operational Readiness Review (ORR) Inspections

- ORR inspections will:
  - Be required by a license condition.
  - Include safety program readiness, including the REMP.
  - Occur prior to authorization of operations.
- If significant inspection findings are identified, NRC authorization of EREF operations would be impacted.

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Inspections During Operations and Decommissioning

Radiological monitoring program is inspected on an annual basis.

- Baseline program outlined in NRC Inspection Manual Chapter 2600, Fuel Cycle Facility Operational Safety and Safeguards Inspection Program (NRC000213)
- Verify continued effective implementation of the REMP
- If significant inspection findings are identified, additional inspection resources may be allocated to verify effective disposition of the issues, as needed.
- Annual inspections will continue during the operational lifetime of the EREF, and will continue through decommissioning phase as needed.

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Conclusion

NRC Region II will verify through inspection that the radiological monitoring program is properly implemented, adequately tested, and fully capable during the period from approximately one year before the start of operations to the end of decommissioning.

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