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 Docket No. 40-8681

MEMORANDUM FOR: Docket File No. 40-8681

FROM: Susan E. Pantell
 Uranium Recovery Licensing Section
 Low Level Waste Licensing Branch

SUBJECT: REVIEW OF 10 CFR 40.65 ENVIRONMENTAL MONITORING
 REPORT FOR THE ENERGY FUELS NUCLEAR, INC., WHITE MESA
 MILL FOR JUNE TO DECEMBER 1981 AND FOR JANUARY TO
 MARCH 1982

Energy Fuels Nuclear, Inc. submitted the following reports for compliance with 10 CFR 40.65 and license requirements for implementation of 40 CFR 190: 1) report for the second half of 1981, submitted by letter dated March 9, 1982; 2) supplemental fourth quarter 1981 lo-vol air particulate data, submitted by letter dated May 24, 1982; and 3) first quarter 1982 data, submitted by letter dated May 21, 1982.

I. Environmental Monitoring Data

Stack Sampling

Stack sampling results for the second half of 1981 were reported for the yellowcake dryer stack and three plant stacks. The stack sampling result for uranium from the dryer stack was reported for the first quarter of 1982. The highest annual release from all of the stacks for the three quarters was 3.89×10^{-2} Ci for uranium from the dryer stack. This value is about 66% higher than the yellowcake scrubber release value predicted in the March 31, 1982 Environmental Impact Appraisal. The highest annual plant stack release for uranium, thorium-230, and radium-226 combined was 4.64×10^{-3} Ci.

The values for the second half of 1981 for thorium-230 from two of the plant stacks and for uranium and thorium-230 from the dryer stack were above, by as much as two orders of magnitude, the maximum permissible concentrations (MPC's) for restricted areas, as specified in Appendix B to 10 CFR 20. The value for uranium for the

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first quarter of 1982 was above the MPC but less than the data for uranium from the previous report.

These concentrations are measured inside the tops of the stacks, which are at least ten meters above the ground, and the majority of the particulates emitted from the stacks are transported offsite. Therefore, it is unlikely that doses within the restricted area boundary would be considerably affected by these concentrations. Furthermore, the offsite air particulate values, discussed below, comply with the unrestricted area MPC limits. Therefore, the stack sampling data are acceptable.

The licensee reports that they did not allow sufficient time to pass between stack samples for the 1981 report, but that they have since corrected this situation.

Air Particulate Sampling

Air particulate data for the three quarters were reported for five locations: at the nearest residence, at the meteorological station, at two locations south and southeast of the tailings, and at Black Mesa, which represents background concentrations. The highest results in the 1981 report, irrespective of any particular sample, were: 5.70×10^{-15} $\mu\text{Ci/ml}$ for uranium, 4.78×10^{-15} $\mu\text{Ci/ml}$ for thorium-230, 2.74×10^{-15} $\mu\text{Ci/ml}$ for radium-226, and 2.64×10^{-14} $\mu\text{Ci/ml}$ for lead-210. All of the values were less than 6.5% of the MPC limits for unrestricted areas. The air particulate data showed no significant change from the data in the previous monitoring report (January to June 1981).

The highest reported values for the first quarter of 1982, irrespective of any particular sample were: 2.16×10^{-15} $\mu\text{Ci/ml}$ for uranium, 2.93×10^{-15} $\mu\text{Ci/ml}$ for thorium-230, 1.16×10^{-15} $\mu\text{Ci/ml}$ for radium-226, and 2.98×10^{-14} $\mu\text{Ci/ml}$ for lead-210. These values do not vary significantly from the data for the second half of 1981.

The lower limits of detection (LLD's) reported for the first quarter of 1982 were above the values required by SUA-1358, License Condition No. 37. The LLD's reported by the licensee were 9.0×10^{-16} $\mu\text{Ci/ml}$ for natural uranium, 3.0×10^{-15} $\mu\text{Ci/ml}$ for thorium-230, 4.0×10^{-15} $\mu\text{Ci/ml}$ for radium-226, and 2×10^{-14} $\mu\text{Ci/ml}$ for lead-210. Based on the errors reported for the monitoring data, the actual LLD's for the count times used to evaluate the

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particulate sample were much lower than those reported by the licensee. This inconsistency should be corrected and the actual LLD's for the sample count time should be reported. As reported, the thorium and radium data are not significantly different from the counting instrument background. Therefore, these LLD's are unacceptable.

Groundwater Sampling

In accordance with the licensed program, the results of sampling at ten groundwater locations were reported. No groundwater monitoring of wells used for drinking water or livestock within 2 km of the tailings was conducted because the licensee has previously reported that no wells within this area are presently used for those purposes.

The highest reported results for all three quarters, irrespective of any particular groundwater sample, were: 4.12×10^{-8} $\mu\text{Ci/ml}$ for uranium, 2.90×10^{-9} $\mu\text{Ci/ml}$ for thorium-230, 1.60×10^{-9} $\mu\text{Ci/ml}$ for radium-226, 8.80×10^{-9} $\mu\text{Ci/ml}$ for lead-210, and 4.10×10^{-8} $\mu\text{Ci/ml}$ for polonium-210. All of these values are below the 10 CFR 20 MPC's for unrestricted areas. These values do not vary significantly from the pre-operational groundwater data (Dames & Moore, "Initial Baseline and Pre-Operational Monitoring," March, 1980).

The groundwater radionuclide and total dissolved solids data for the second half of 1981 were slightly higher than the values in the previous monitoring report. The data for the first quarter of 1982 were, for the most part, slightly lower than the data for the second half of 1981.

The chemical groundwater data were not reported with the other data, but were included in separate tables attached to the report. Based on a review of this data and comparison to previous data, there is no indication by chemical parameter variance of any seepage of tailings liquids.

Surface Water

The results of two surface water samples at Cottonwood Creek were reported for the three quarters. There was no flowing water at Westwater Canyon during the second half of 1981, but data from there were reported for the first quarter of 1982. The highest reported

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results for the three quarters were: 8.12×10^{-9} $\mu\text{Ci/ml}$ for uranium, 2.70×10^{-10} $\mu\text{Ci/ml}$ for thorium-230, 1.84×10^{-9} $\mu\text{Ci/ml}$ for radium-226, 1.10×10^{-8} $\mu\text{Ci/ml}$ for lead-210, and 7×10^{-10} $\mu\text{Ci/ml}$ for potassium-210. All of these values are below the MPC's for unrestricted areas. The highest reported value for total suspended solids was 860 mg/liter for the third quarter of 1981. The surface water data show no significant change when compared with previous monitoring data.

Radon Sampling

Radon gas sampling data were collected at the five air particulate monitoring locations. Due to problems experienced with the EDA instrumentation, no data were reported for July to October, 1981. Last November the licensee purchased five GARD passive radon monitoring units, which were used for the November and December, 1981 and the first quarter of 1982 readings. The licensee did not include counting error terms for the radon readings.

The highest reported value was 7.50×10^{-10} $\mu\text{Ci/ml}$, which is 25% of the MPC limit for unrestricted areas. The radon gas data show almost no change from the previous monitoring data.

Direct Radiation

Direct gamma radiation was monitored using environmental TLD's at the five air particulate monitoring locations. The highest reported value was 28.1 mrem/qtr for the fourth quarter of 1981 measured at Black Mesa, which represents background. Although for the fourth quarter of 1981 the highest reported value was for the background location, the maximum value for the third quarter of 1981 was 3.9 mrem/qtr above background at the meteorological station, and the maximum value for the first quarter of 1982 was 3.6 mrem/qtr above background at the S.E. tailings area. The radiation data were similar to or less than the previously reported values and were typical of background radiation levels in the area.

Soil

Soil samples were taken for the 1981 report at the five air particulate monitoring locations and were measured for uranium and radium-226 in accordance with the licensed program. The highest

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reported values for all locations were 3.0 pCi/gm for uranium and 0.4 pCi/gm for radium-226.

These soil sample results are low when compared with other reported data. The highest reported concentrations in soil in the previous monitoring report were 15 pCi/gm for uranium and 65 pCi/gm for radium-226. The licensee informed us by phone on July 23, 1982 that they believe that the high values reported for the first half of 1981 are due to errors in the laboratory analysis. They have since employed the services of a different laboratory, Alpha Nuclear, to perform the soil analyses.

Vegetation

Vegetation samples of dry concentrations of crested wheatgrass were reported for the second half of 1981. Three samples of crested wheatgrass were taken at locations northeast, northwest, and southwest of the mill and were measured for radium-226 and lead-210 in accordance with the licensed program. The highest reported values were 2.73 pCi/gm for radium-226 and 7.1 pCi/gm for lead-210, both measured at the location northwest of the mill. These data were larger than the highest values in the previous monitoring report, which were 0.7 pCi/g for radium-226 and 3.92 pCi/g for lead-210.

II. 40 CFR Part 190 Dose Assessment

Pathway Considerations

The licensee was to report computed doses for compliance with 40 CFR 190, as specified in License Condition No. 50 of SUA-1358. The licensee reported inhalation doses for the three quarters. Doses from external radiation and from ingestion of meat of cattle grazing on contaminated vegetation were not reported.

Doses from Inhalation of Airborne Particulates

The licensee reported dose estimates at the nearest residence resulting from the measured net concentration of particulates for the three quarters. The highest computed doses, which were for the first quarter of 1982, were 0.107 mrem/year to the whole body, 3.55 mrem/year to the bone, and 4.02 mrem/year to the lung. I checked the licensee's computations and found them accurate.

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Doses from External Radiation

Doses from external radiation at a particular location are determined by subtracting the background direct radiation exposure rate, measured at Black Mesa, from the exposure rate at the location. The reported exposure rates at the monitor locations did not vary significantly from those measured at the background location, so doses from external radiation are negligible.

Doses from the Ingestion of Meat from Cattle Grazing on Contaminated Vegetation

The doses from the ingestion of meat from cattle grazing on contaminated vegetation were determined using the concentration of 2.73 pCi/gm of radium-226 in dry vegetation measured at the monitor northwest of the mill. This number was adjusted to determine the wet concentration by dividing by 5. The background concentration of 2.20×10^{-6} $\mu\text{Ci/kg}$ (from Dames & Moore, "Initial Baseline and Pre-Operational Monitoring," May 1, 1980) was subtracted to determine the mill-contributed concentration of 5.44×10^{-4} $\mu\text{Ci/kg}$. The doses at the nearest residence resulting from this radium-226 concentration in the vegetation were 0.832 mrem/year to the whole body, 8.32 mrem/year to the bone, 0.001 mrem/year to the liver, and 0.030 mrem/year to the kidney. These doses were computed based on information provided by the licensee that cattle are grazed in the area for about one sixth of the year. The computed bone doses, based only on the radium-226 contribution, were less than the 40 CFR 190 limit of 25 mrem/year to each organ.

Total Annual 50-Year Dose Commitments

The total annual 50-year dose commitments at the nearest residence result from the sums of the maximum doses over all three quarters from the three pathways discussed. The whole body dose includes the dose from external exposure. The total annual doses are:

Whole Body	1.0 mrem
Bone	10.2 mrem
Lung	2.5 mrem

The composite values indicate that the licensee is in compliance with the 40 CFR 190 dose limit.

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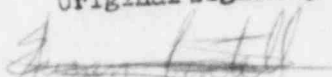
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III. Conclusions and Recommendations

1. The licensee should ensure that the laboratories which analyze the air particulate samples use the LLD's in Regulatory Guide 4.14, as required by License Condition No. 37 of SUA-1358.
2. The licensee should submit an updated map of environmental monitoring sites to include all of the monitoring locations.
3. The licensee should include the counting error for the radon gas measurements in the next quarterly report.
4. The soil sample data for the second half of 1981 differ significantly from the data for the first half of 1981. This variation in soil sample results is attributed by the licensee to use of different analytical laboratories. To alleviate this problem, the licensee should ensure that future soil sample analyses are performed in a consistent manner.
5. For the next report the licensee should provide a complete dose assessment according to the guidelines in Appendix A of "Compliance Determination for Environmental Radiation Protection for Uranium Recovery Facilities - 40 CFR 190".

Original signed by



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Approved by:

Dan E. Martin, Section Leader
Uranium Recovery Licensing Section
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