



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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September 14, 2016

MEMORANDUM TO: Bill VonTill, Chief  
Uranium Recovery Licensing Branch  
Division of Decommissioning, Uranium Recovery,  
and Waste Programs  
Office of Nuclear Material Safety  
and Safeguards

FROM: Ron Linton, Project Manager */RA/*  
Uranium Recovery Licensing Branch  
Division of Decommissioning, Uranium Recovery,  
and Waste Programs  
Office of Nuclear Material Safety  
and Safeguards

SUBJECT: REVIEW OF URANERZ ENERGY CORPORATION, NICHOLS RANCH  
IN SITU RECOVERY PROJECT, SEMI-ANNUAL AND QUARTERLY  
REPORT FOR THE REPORTING PERIOD JULY 1, 2015, THROUGH  
DECEMBER 31, 2015 (CAC NO. L00813)

The Uranerz Energy Corporation (Uranerz or the licensee) submitted to the U.S. Nuclear Regulatory Commission (NRC), the following reports for the Nichols Ranch In Situ Recovery (ISR) Project. These documents are available in the Agencywide Documents Access and Management System (ADAMS) under Accession Numbers as stated below:

- Uranerz Energy Corporation, Nichols Ranch ISR Project, Wyoming Department of Environmental Quality - Land Quality Division (WDEQ-LQD) Permit to Mine No. 778 and NRC License SUA-1597, Quarterly Report, October 19, 2015 (ADAMS Accession No. ML15303A395);
- Uranerz Energy Corporation, Nichols Ranch ISR Project, WDEQ-LQD Permit to Mine No. 778 and NRC License SUA-1597, Quarterly Report, January, 2016 (ADAMS Accession No. ML16040A256); and
- Uranerz Energy Corporation, Nichols Ranch ISR Project, License SUA-1597, Semi-Annual Report, July 1, 2015 - December 31, 2015, February 26, 2016 (ADAMS Accession No. ML16091A186).

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The Uranerz Materials License SUA-1597, License Condition (LC) 11.1.A, requires the submission of a quarterly report summarizing wells on excursion. The LC 11.1.B, requires a semi-annual report that discusses the status of long term excursions and a summary of Mechanical Integrity Tests during the reporting period. The LC 11.1.D, requires, consistent with Regulatory Position 2 of Regulatory Guide 4.14 (as revised), a semi-annual report that summarizes the results of the operational effluent and environmental monitoring program. The LC 11.2 requires the licensee to submit the results of the annual review of the radiation protection program content and implementation performed in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20.1101(c), including an analysis of dose to individual members of the public consistent with 10 CFR 20.1301 and 10 CFR 20.1302.

The NRC staff reviewed the above listed reports. Staff's observations are provided in the enclosure.

Enclosure:  
NRC Staff Review of Uranerz  
Semi-Annual Effluent Report

cc: D. Kolkman (Uranerz)  
J. McCarty (Uranerz)  
D. Larner (WDEQ)

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**U. S. NUCLEAR REGULATORY COMMISSION STAFF REVIEW  
OF THE SEMI-ANNUAL EFFLUENT AND ENVIRONMENTAL MONITORING REPORT AND  
QUARTERLY REPORTS, JULY 1, 2015, THROUGH DECEMBER 31, 2015,  
URANERZ ENERGY CORPORATION, NICHOLS RANCH IN SITU RECOVERY PROJECT**

**Introduction**

The above reports are required by License Condition (LC) 11.1, 11.2 and Title 10 of the Code of Federal Regulations (10 CFR) Part 40.65. The reports have been reviewed by the U.S. Nuclear Regulatory Commission (NRC) Uranium Recovery Licensing Branch (URLB), project manager and staff hydrogeologist for the Nichols Ranch Project and the URLB staff health physicist. Staff's observations are provided below.

**Operational Monitoring**

The licensee reported that the Nichols Ranch Project continued operations with the injection of lixiviant and uranium production at header houses 1 through 6 in Nichols Ranch Unit, Production Area No. 1. Header house 5 was brought online during the reporting period. The licensee reports that two deep disposal wells are operating. No activities took place at the Hank Unit.

The licensee reported for the 3<sup>rd</sup> quarter of 2015 a total of 252,741,400 gallons of lixiviant injected, 255,000,500 gallons recovered, with a total bleed rate of 2,377,950 gallons, or 0.9 percent. Using values reported in Table 3 of the October 19, 2015, 3<sup>rd</sup> quarter report, the NRC staff independently calculated weekly bleed rates. NRC staff determined that the weekly wellfield bleed reported in gallons in Table 3, from July 26, 2015, through Sept 20, 2015, did not equal the reported recovery in gallons minus the reported injection in gallons. NRC staff calculated the total bleed for the quarter to be 2,259,100 gallons, not 2,377,950 gallons as reported. However, NRC staff did determine that the bleed rate remained 0.9 percent. The 0.9 percent bleed rate is consistent with the anticipated bleed rate in the approved license application.

The licensee reported for the 4<sup>th</sup> quarter of 2015 a total of 252,289,400 gallons of lixiviant injected and 254,584,650 gallons recovered, with a total bleed rate 2,295,250 gallons, or 0.9 percent. Using values reported in Table 3 of the January 25, 2016, 4<sup>th</sup> quarter report, the NRC staff independently calculated weekly bleed rates. All values were calculated correctly. The 0.9 percent bleed rate is consistent with the anticipated bleed rate in the approved license application.

The licensee reported one well failed the Mechanical Integrity Testing (MIT) during the semi-annual reporting period, BV-034. The well was abandoned and plugged. The licensee stated all wells were abandoned using techniques approved by the Wyoming Department of Environmental Quality (WDEQ). The NRC staff reviewed the MIT test data for all wells provided in the quarterly reports and all wells held pressure within the MIT testing criteria used by the licensee, with exception of the one reported failure.

Enclosure

The licensee reported weekly maximum injection pressure at each header house. The Uranerz reported no header house pressures greater than the 150 psi limit at header houses 1 through 6 for the reporting period. The NRC staff reviewed the injection pressure data and did not identify any reported pressures in excess of the 150 psi maximum pressure limit.

The licensee reported one unplanned release of byproduct material during the reporting period. The release was reported to the NRC via e-mail on November 5, 2015, and in a letter dated November 10, 2015, addressed to the WDEQ and copied to the NRC. Approximately 655 gallons were released from well N1A-078.

The licensee reported there are no activities occurring at the Hank Unit.

The licensee reported that 570,578 barrels, year to date, have been disposed using the deep injection wells.

## **Environmental Monitoring**

### Surface and Ground Water Sampling

The licensee reported no monitoring wells on excursion during the reporting period. The licensee provided all excursion monitoring data. The NRC staff notes that all excursion monitoring data is not required by LC. The NRC LC only requires submission of those wells on excursion. However, the NRC staff acknowledges the licensee is combining information required by the NRC and the WDEQ into one report. Therefore, additional data not required by the NRC LC may be reported by the licensee. The NRC staff reviewed the excursion monitoring data and confirmed that each excursion monitoring well was sampled twice monthly, at least two weeks apart, for the reporting period, as required by LC 11.5, with the exception of MW MRN-18-1, which was not sampled twice in December, 2015.

Groundwater sampling results from domestic and livestock wells sampled within 1 kilometer of the production are reported on an annual basis and included in the semi-annual report. The groundwater results from reporting period were compared to the results from the 2013 and 2014 4th quarter reports and the results are consistent with past reported values.

There are two surface water self-samplers located at the Nichols Ranch Unit. Surface water was sampled at Cottonwood Creek at location D and U on three different dates. There are few historical samples to compare the results taken at Nichols since most drainages in the area are dry. NRC staff will review data trends provided samples can be taken during future reporting periods.

### Sediment and Soil Sampling

The units Uranerz used to report the results in Appendices C (sediment) and D (soil) are not correct. The values for radium-226 (Ra-226), lead-210 (Pb-210), and thorium-230 (Th-230) are 1,000 times lower than previous values.

### Air Particulate, Radon, and Gamma Radiation Monitoring

Regarding the values reported in Appendices E and F, Uranerz incorrectly compared environmental air station concentrations of radionuclides to effluent concentration values in 10 CFR Part 20, Appendix B, Table 2. The air stations are not at the boundary of the unrestricted area, as required by 10 CFR 20.1302(b)(2)(i), and, therefore, cannot be used to demonstrate compliance under 10 CFR 20.1302(b)(2). However, this error is of no consequence, since Uranerz chose to demonstrate compliance for calendar year 2015 using 10 CFR 20.1302(b)(1), which requires a dose assessment. The NRC staff's comments on the Uranerz demonstration of compliance with public dose limits is provided below in the Public Dose section.

Regarding the censoring of data and the reporting of "ND" in place of actual values, the guidance in Section 7.5 of Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring at Uranium Mills," states, "The term 'not detected,' 'less than the lower limit of detection (LLD),' or similar terms should never be used. Each reported result should be a value and its associated error estimate, including values less than the lower limits of detection or less than zero." Uranerz should ask its laboratory to discontinue censoring its data.

### Effluent Monitoring Program

The results for radon-222 effluents were incorrectly identified as being summarized in Appendix E. These results are summarized in Appendix I. The results for average concentrations are incorrectly identified as being summarized in Appendix D and E. These results are summarized in Appendices E and F.

The requirement in 10 CFR 40.65 states that the report must specify the quantity of each of the principal radionuclides released to unrestricted areas in liquid and in gaseous effluent during the previous six months of operation. Uranerz instead provided an annual quantity for 2015.

In addition to providing one year of effluent quantities, rather than six month quantities, Uranerz made other errors in its estimates of effluent quantities of radon-222 and its short-lived progeny. Using the information provided by Uranerz in its report, NRC staff determined that the values for CPP tanks, header houses, deep disposal well house, and recovery wells are each 10 times too high. The NRC staff, after correcting for errors and computing the results for a semi-annual period and appropriate background value for the second half of 2015 (7E-16 curies per milliliter [Ci/mL]), estimates the semi-annual effluent quantity for July to December 2015 as approximately 60 curies (Ci) of radon-222 in equilibrium with its short-lived progeny. The radon-222 semi-annual quantity for January to June 2015 was previously reported as 77.35 Ci of radon-222 in equilibrium with its short-lived progeny. Therefore, the correct 2015 annual total would be about  $77.35 + 60 = 137$  Ci of radon-222 in equilibrium with its short-lived progeny, not 987.33 Ci.

### **Summary of Employee Urinalysis Results**

Uranerz reported that during 2015 there were zero cases of detectable quantities of total uranium in bioassay samples.

## Public dose

The Uranerz estimate of public dose for 2015 included three components: (1) an internal dose from inhalation of radon-222 and its short-lived progeny of 60 mrem per year; (2) an internal dose from inhalation of particulate matter radionuclides of 0.26 mrem per year; and (3) an external dose of 10.5 mrem per year. The total dose reported by Uranerz was 70.73 mrem per year. The NRC staff determined Uranerz incorrectly used 0.23 mrem per year, the inhalation dose from only Po-210 particulate matter inhalation, to estimate the total dose, instead of the inhalation dose from all particulate radionuclides (i.e., 0.26 mrem dose from inhalation of natural uranium, Th-230, Ra-226, Pb-210, and Po-210). However, as noted below, the value of 0.26 mrem is not correct anyway.

Uranerz made two errors in its assessment of public dose from particulate radionuclides in air. The first error is that Uranerz summed concentrations of radionuclides in air for four quarters to arrive at total concentrations for each location (i.e., NA-4 background and NA-6 downwind). Periodic measurements of concentrations should be averaged, not summed, because a sum of individual concentrations has no physical meaning. The annual average background concentration may be subtracted from the annual average downwind concentration to estimate public dose. In its second error, Uranerz used Th-230 concentrations in air to estimate to the public dose contribution from airborne natural uranium. The NRC staff, after correcting for these errors, estimated the public dose from particulate radionuclides in air to be about 0.06 mrem per year, not 0.26 mrem per year.

In its assessment of public dose from radon and radon progeny, Uranerz did not correctly calculate the location average concentration of radon at the CPP Fence (West Side). In Appendix F, Uranerz reported a value of  $8.00\text{E-}10$  microcuries per milliliter ( $\mu\text{Ci/mL}$ ) for this location. NRC staff calculated the average to be  $7.33\text{E-}10$   $\mu\text{Ci/mL}$ , using the three semi-annual results listed in the table (i.e.,  $6\text{E-}10$ ,  $6\text{E-}10$ , and  $1\text{E-}9$   $\mu\text{Ci/mL}$ ). In addition, the first entry in the equation for radon dose estimate on p. 10 of the semi-annual report should be  $6.1\text{E-}10$   $\mu\text{Ci/mL}$ , not  $6\text{E-}10$   $\mu\text{Ci/mL}$ . The NRC staff estimates the resulting dose is 62.5 mrem, rather than 60 mrem.

After correcting several errors made by Uranerz, as described above, the NRC staff's estimate of the public dose is approximately 73 mrem for 2015, of which 62.5 mrem is attributable to inhalation of radon-222 and its progeny, 0.06 mrem is attributable to inhalation of particulate radionuclides, and 10.5 mrem is attributable to external radiation.