

October 15, 2015

Mr. Michael Griffin  
Vice President of Permitting, Regulatory  
and Environmental Compliance  
Strata Energy, Inc.  
PO Box 2318  
Gillette, WY 82717-2318

SUBJECT: ADDITIONAL COMMENTS ON SUBMITTAL REGARDING LICENSE  
CONDITION 12.7, ROSS IN-SITU RECOVERY (ISR) PROJECT, CROOK  
COUNTY, WY, SOURCE MATERIAL LICENSE SUA-1601, DOCKET NO. 040-  
09091, TAC J00735

Dear Mr. Griffin:

By letter dated July 30, 2015, Strata Energy, Inc. (Strata) responded to the U.S. Nuclear Regulatory Commission (NRC) staff's comments and request for additional information pertaining to license condition (LC) 12.7 (ADAMS Accession No. ML15224B400). The NRC staff's comments and request for additional information were provided to Strata by letter dated July 23, 2015 (ADAMS Accession No. ML15190A156).

The NRC staff has completed its technical review of Strata's July 30, 2015, response. The NRC staff is requesting additional clarification on LCs 12.7 A) and 12.7 B). Upon receipt of Strata's reply, the staff will continue its evaluation and notify Strata in writing of its results.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure" a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

M. Griffin

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If you have any questions regarding this action, please contact me at 301-415-0697 or by e-mail at [John.Saxton@nrc.gov](mailto:John.Saxton@nrc.gov).

Sincerely,

*/RA/*

John Saxton, Hydrogeologist  
Uranium Recovery Licensing Branch  
Division of Decommissioning, Uranium Recovery  
and Waste Programs  
Office of Nuclear Material Safety  
and Safeguards

Docket No.: 040-09091  
License No.: SUA-1601

Enclosure: Comments on Strata's July 23, 2015,  
Response Regarding LC 12.7

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**NRC Staff Comments on Strata Energy, Inc., Letter Dated July 30, 2015**  
**Preoperational License Condition 12.7**  
**Materials License SUA-1601; Docket No. 040-09091**

**Background**

On April 24, 2014, NRC issued Materials License SUA-1601 to Strata Energy, Inc. (Strata) (NRC 2014b). License condition 12.6 of Strata's Materials License SUA-1601 states that the licensee shall not commence operations until the NRC performs a preoperational inspection to confirm, in part, that operating procedures and approved radiation safety and environmental monitoring programs are in place, and that preoperational testing is complete. As Strata prepares for its preoperational inspection, it is also resolving several preoperational license conditions. Among these is license condition (LC) 12.7, which states:

- 12.7 No later than 30 days before the preoperational inspection, the licensee shall provide to the NRC staff, for review and written verification, written procedures for its airborne effluent and environmental monitoring program that:
- A) Discuss how, in accordance with 10 CFR 40.65, the quantity of the principal radionuclides from all point and diffuse sources will be accounted for, and verified by, surveys and/or monitoring.
  - B) Discuss and identify how radon (radon-222) progeny will be factored into analyzing potential public dose from operations consistent with 10 CFR Part 20, Appendix B, Table 2.
  - C) Discuss how, in accordance with 10 CFR 20.1501, the occupational dose (gaseous and particulate) received throughout the entire License Area from licensed operations will be accounted for, and verified by, surveys and/or monitoring.

By letter dated March 1, 2015, Strata provided its responses to preoperational license conditions (LCs) 12.7 and 12.8 of Materials License SUA-1601 (Strata 2015a). By letter dated July 23, 2015, NRC staff provided comments on Strata's March 1, 2015, letter (NRC 2015). By letter dated July 30, 2015, Strata responded to NRC staff's comments on LC 12.7 (Strata 2015b). The following are additional NRC staff comments on Strata's July 30, 2015, letter.

**Additional NRC Staff Comments on Strata's Response to LC 12.7 A)**

NRC staff has evaluated Strata's March 1, 2015, and July 30, 2015, letters pertaining to LC 12.7 A) (Strata 2015a, 2015b). The NRC staff has prepared Table 1 of this letter to summarize Strata's proposed plan to estimate, by surveys and/or monitoring, the quantity of each principal radionuclide released from all point and diffuse sources at the Ross ISR Project.

Enclosure

**Table 1. Ross ISR Project Summary of Methods to Estimate Effluent Quantities in Accordance with 10 CFR 40.65**

Type of Effluent	Effluent Location				
	CPP Occupied Spaces	Process Vents	Header Houses & DDW Houses	Wellfields	Spills
Particulate matter*	Isotopic analysis of yellowcake and air samples*  <i>Need a description of frequency and method for determining air effluent quantities, including when bay doors are open and there is no active ventilation</i> [Comment 1]	Not measured**	[Semiannual isotopic analysis of monthly filters] x [design exhaust volume]	Not measured***	[Recent process fluid assay] x [volume of spill]
Radon	Monthly radon-in-water loss term		<i>When measuring progeny, assuming 1:1 equilibrium with radon is not conservative. Need to explain how radon quantities will be estimated.</i> [Comment 2]	<i>When measuring progeny, assuming 1:1 equilibrium with radon is not conservative. Need to explain how radon quantities will be estimated.</i> [Comment 2]	[Radon-in-water at time of spill] x [volume of spill]
Radon progeny	<i>Need to explain how effluent quantities of radon progeny will be estimated. Equilibrium may be assumed.</i> [Comment 3]		[Monthly W.L.] x [design exhaust volume]	[Quarterly W.L. of 10% of production wells] x [2 LPM]	<i>Need to explain how effluent quantities of radon progeny will be estimated. Equilibrium may be assumed.</i> [Comment 3]

\* License Condition 10.16 requires sampling and analysis for Nat. U, Th-230, Ra-226, Po-210, and Pb-210 at each restricted area air particulate sampling location.

\*\* NRC staff agrees that process vents for wet processes at this ISR would not contain significant particulate matter, and this source does not need to be separately surveyed or measured.

\*\*\* NRC staff agrees that operating wellfields are not sources of significant diffuse emissions of particulate matter, and this source does not need to be separately surveyed or measured.

The following describes NRC staff's requests for additional clarification pertaining to Strata's proposed plan:

*1. Air Effluent Quantities from the Central Processing Plant – Particulate Matter*

In Section 1.4.1 of its March 1, 2015, letter, Strata explained its program for isotopic analysis of yellowcake and air samples collected in the plant (Strata 2015a). However, Strata did not explain how it would use this isotopic characterization data to estimate quantities of principal radionuclides in air effluent. NRC staff provided a comment to that effect in its letter to Strata dated July 23, 2015 (NRC 2015). In its July 30, 2015, response, Strata stated that the yellowcake analysis would "... allow for a greater understanding of the quantity of principal radionuclides present in the yellowcake product," but did not explain how either the yellowcake analysis or air sample isotopic analysis would be used to estimate effluent quantities from the central processing plant (CPP) (Strata 2015b). Strata needs to explicitly describe how it will combine the results of air samples with CPP ventilation rates (or other information) to estimate the quantities of principal radionuclides released during each semi-annual reporting period. This explanation should address periods during which CPP bay doors are open and/or active ventilation is not used.

*2. Air Effluent Quantities of Radon Estimated using Working Level Measurements*

The methodology proposed by Strata to estimate quantities of radon in air effluent for the header houses, deep disposal well houses, and well fields (production wells) is not correct or conservative. To illustrate, the formula for the radon equilibrium factor, F (refer to Section 4.9.3.2 of NRC 2014a), is given as:

$$F = \left( \frac{\text{radon progeny concentration (WL)}}{\text{radon concentration (pCi/L)}} \right) \times \left( \frac{100 \text{ pCi/L}}{\text{WL}} \right) \quad (1)$$

Working level ("WL" in Equation 1 above) is a measure of short-lived radon progeny concentration in air. Strata proposed to measure working levels, and not radon, in header houses, deep disposal well houses, and well fields (production wells).

While assuming 100% equilibrium (i.e., F = 1) is a conservative assumption when estimating the radon progeny concentration (working level) from a known (e.g., measured) concentration of radon, this is not true for estimating radon concentrations from working level measurements. For example, if the value of the radon equilibrium factor in Equation (1) is 10% (i.e., F = 0.1), as it could be inside a well-ventilated space like a header house, the estimated radon concentration will be ten times the measured working level concentration.

A method acceptable to NRC staff for determining radon effluent quantities from header houses, deep disposal well houses, and production well covers is to use passive track-etch devices inside those spaces to measure radon concentrations. For header houses and deep disposal well houses, effluent quantities could then be estimated using the design flow rates of exhaust fans and operating times, as previously described by Strata. Similarly, Strata could assume the flow rate of the pump used for the working level measurement to calculate radon effluent quantities from production well covers.

### *3. Air effluent quantities of radon progeny when radon is measured*

For areas in which Strata proposed to estimate radon air effluent quantities on the basis of measured radon concentrations in process water (i.e., the CPP, process vessels, and spills), Strata did not explain how it would estimate effluent quantities of radon progeny. Therefore, Strata should revise its proposal to address effluent quantities of radon progeny from these areas. As noted above in comment 2, is it acceptable and conservative to estimate radon progeny concentrations from radon measurements by assuming 100% equilibrium.

#### **Additional NRC Staff Comments on Strata's Response to LC 12.7 B)**

In its July 23, 2015, letter, NRC staff had one comment on Strata's March 1, 2015, response to LC 12.7 B) (NRC 2015). NRC staff's comment No. 8 asked Strata to revise its plan for accounting for radon progeny in estimates of public dose because lead-210 is not a reasonable proxy for short-lived radon progeny emitted from nearby sources. By letter dated July 30, 2015, Strata explained that it would adopt the approach described in Section 4.2.2 of NRC's Draft Interim Staff Guidance, "Evaluations of Uranium Recovery Facility Surveys of Radon and Radon Progeny in Air and Demonstrations of Compliance with 10 CFR 20.1301." (NRC 2014a) Specifically, Strata committed to use the MILDOS-AREA code to calculate concentrations of radon and radon progeny at the boundary of the unrestricted area for comparison with values in 10 CFR Part 20, Appendix B, Table 2. The Draft ISG states that licensees may use calculations to estimate source terms (i.e., release rates), but that measurements should be made to confirm the calculated release quantities. In its July 30, 2015, response, Strata committed to installing a network of radon samplers in each of the eight cardinal and ordinal directions at the security perimeter around the CPP.

Strata should clarify whether: (1) calculated source terms (e.g., using Regulatory Guide 3.59); or (2) measured source terms determined in accordance with the effluent monitoring plan developed to comply with LC 12.7 A) will be used with MILDOS-AREA to estimate downwind concentrations at the boundary of the unrestricted area. Either the measured source terms, or the larger of the measured and calculated source terms for each point and diffuse source, would be acceptable to NRC staff.

#### **NRC Staff Verification of Strata's Response to LC 12.7 C)**

The purpose of LC 12.7 C) is to ensure that Strata accounts for occupational dose outside the CPP that is received by employees whose occupational dose is monitored in accordance with 10 CFR 20.1502. In its March 1, 2015, response, Strata stated that it would calculate occupational doses outside the CPP by calculating radon effluent quantities and using MILDOS-AREA to calculate occupational doses in the licensed area (Strata 2015a). Strata stated that it would verify, by measurements, that there are no detectable concentrations of uranium in air outside the CPP. Strata stated it would also identify 4 to 6 areas of highest occupational dose from radon calculated using MILDOS-AREA and perform radon measurements on both a quarterly and semiannual frequency for one year. By letter dated July 23, 2015, NRC staff stated that this plan does not account for occupational dose received inside structures outside the CPP (e.g., header houses) and does not provide for external exposure monitoring outside the CPP. By letter dated July 30, 2015, Strata explained that it will monitor external dose to all regular fulltime employees using personal monitoring devices. Strata explained that employees will be required to wear personal monitoring devices at all times while at work in all areas. Strata also explained that it will assess occupational exposure outside the CPP by performing surveys for particulate matter in air, radon, and radon progeny in wellfields, header houses, and

deep disposal well buildings. When assigning occupational dose to employees who work in the CPP controlled area, Strata stated it will use the larger of the indoor air sample results and outdoor sample results. Strata will assign separate occupancy factors based on employee time spent in the wellfield and the CPP.

The NRC staff verifies that Strata's proposed methods for accounting for occupational dose received throughout the licensed area from licensed and unlicensed sources meets the requirements of 10 CFR 20.1501 and is, therefore, acceptable.

## **References**

NRC (U.S. Nuclear Regulatory Commission). 2014a. FSME Interim Staff Guidance: Evaluation of Uranium Recovery Facility Surveys of Radon and Radon Progeny in Air and Demonstrations of Compliance with 10 CFR 20.1301. FSME-ISG-01. Washington, DC. ADAMS Accession No. ML13310A198

NRC (U.S. Nuclear Regulatory Commission). 2014b. U.S. Nuclear Regulatory Commission Materials License No. SUA-1601. Washington, D.C. ADAMS Accession No. ML14069A335.

NRC (U.S. Nuclear Regulatory Commission). 2015. Letter from NRC to Mr. M. Griffin, Strata Energy, Inc., Re: Staff's Comments and Request for Additional Information on Submittals Regarding License Conditions 12.6, 12.7, and 12.8, Ross ISR Project, Crook County, WY, Source Material License SUA-1601, Docket No. 040-09091, TAC J00735, dated July 23, 2015. ADAMS Accession No. ML15190A156.

Strata (Strata Energy Inc.). 2015a. Letter from M. Griffin to NRC, "Strata Energy Ross In Situ Recovery Project, Crook County, Wyoming, Source Materials License SUA-1601, Docket No. 040-09091, License Amendment Request Regarding License Conditions 12.6, 12.7, and 12.8" dated March 1, 2015. ADAMS Accession No. ML15076A014.

Strata (Strata Energy Inc.). 2015b. Letter from M. Griffin to NRC, dated July 30, 2015, "Strata Energy Ross In Situ Recovery Project, Source Materials License SUA-1601, Docket No. 040-09091, Response to Comments on Submittal for License Condition 12.7." ADAMS Accession No. ML15224B400.