

EXPORT LICENSE

NRC FORM 250



United States of America
 Nuclear Regulatory Commission
 Washington, D.C. 20555

NRC LICENSE NO.: PXB184.03

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NRC DOCKET NO.: 11006143

LICENSE EXPIRES: March 31, 2023

Pursuant to the Atomic Energy Act of 1954, as amended, and the regulations issued by the Nuclear Regulatory Commission (NRC) pursuant thereto, and in reliance on statements and representations heretofore made by the applicant/licensee, this license is hereby issued authorizing the licensee to export of the byproduct materials listed below, subject to the terms and conditions herein. This license is only valid if the licensee or 'Other Party (ies) to Export' maintain the requisite NRC or Agreement State domestic license(s).

<p align="center">LICENSEE</p> <p>Halliburton Energy Services, Inc. 3000 N. Sam Houston Parkway E. Houston, TX 77032</p> <p>Attn: Kateri Noel</p>	<p align="center">ULTIMATE CONSIGNEE(S) IN FOREIGN COUNTRY(IES)</p> <p align="center">See following page(s)</p>
<p align="center">INTERMEDIATE CONSIGNEE(S) IN FOREIGN COUNTRY(IES)</p> <p align="center">None</p>	<p align="center">OTHER U.S. PARTY(IES) TO EXPORT</p> <p>Halliburton Energy Services 14851 Milner Road Gate 5 A Dock SR-1/SR/2 Houston, TX 77032</p> <p>(shipping and receiving)</p>
<p>APPLICANT'S REFERENCE: HES3334</p>	<p>ULTIMATE DESTINATIONS: Angola and India</p>

DESCRIPTIONS OF 10CFR PART 110, APPENDIX P, BYPRODUCT MATERIALS TO BE EXPORTED, INCLUDING CONDITIONS AND NOTES
 (NOTE: SEE PAGE 5 FOR DEFINITIONS OF CATEGORY 1 AND CATEGORY 2)

Export to Angola of Category 2 and lesser quantities of [redacted], [redacted] and [redacted]; Category 3 quantities of [redacted]; Category 5 quantities of [redacted]; and sub-millicurie quantities of [redacted] and [redacted] for use in oil and gas well logging operations is authorized. See page 3 for total number of sources and maximum activity levels for each source. When combined for shipping these sources may aggregate to a Category 2 quantity.

Export to India of Category 2 and Category 3 quantities of [redacted] and [redacted], and Category 3 quantities of [redacted], for use in oil and gas well logging operations, is authorized. See Page 4 for total number of sources and maximum activity levels for each source. When combined for shipping these sources may aggregate to a Category 2 quantity.

Sealed sources will remain in the custody of either Halliburton Energy Services or an authorized ultimate foreign consignee at all times, and when not in use, must be stored in a secure facility controlled either by Halliburton Energy Services or an authorized ultimate foreign consignee listed.

Licensee is responsible for compliance with all applicable export, and other domestic regulatory requirements including all terms and conditions of domestic material possession licenses. Licensee, if not already submitted with your application, must submit pertinent documentation required by 10 CFR §110.32(g) at least 24 hours prior to shipment. See Page 5 for Mandatory Pre-shipment Notifications.

Licensee shall submit by February 1 of each year one copy of a report of all americium shipments (under this license or under a general license) during the previous calendar year required by 10 CFR § 110.54(b). The report must include: (1) a description of the material, including quantity; (2) approximate shipment dates; (3) a list of recipient countries, end users, and intended use keyed to the items shipped.

This license replaces PXB184.02 and amends its authority by: 1) adding seven additional addresses; 2) remove Pakistan from the list of Ultimate Consignee(s); 3) extend the expiration date from May 31, 2020 to March 31, 2023; and 4) update the licensee's mailing address and point of contact.

Neither this license nor any right under this license shall be assigned or otherwise transferred in violation of the provisions of the Atomic Energy Act of 1954, as amended.

This license is subject to the right of recapture or control by Section 108 of the Atomic Energy Act of 1954, as amended, and to all the other provisions of said Acts, now or hereafter in effect and to all valid rules and regulations of the Nuclear Regulatory Commission.

THIS LICENSE IS INVALID UNLESS SIGNED BELOW BY AUTHORIZED NRC REPRESENTATIVE

NAME AND TITLE: David L. Skeen
Digitally signed by David L. Skeen
 Date: 2020.03.04 13:23:19 -05'00'
**David L. Skeen, Deputy Director
 Office of International Programs**

DATE OF ISSUANCE: March 4, 2020

ULTIMATE CONSIGNEE(S) IN FOREIGN COUNTRY(IES) Continued:

1. [REDACTED]
India
(oil and gas well logging operations)

2. [REDACTED]
India
(oil and gas well logging operations)

3. [REDACTED]
[REDACTED], Rep. de Angola
(oil and gas well logging operations)

4. [REDACTED]
Angola
(oil and gas well logging operations)

5. [REDACTED]
Angola
(oil and gas well logging operations)

6. [REDACTED]
India
(oil and gas well logging operations)

7. [REDACTED]
India
(oil and gas well logging operations)

8. [REDACTED]
Angola
(oil and gas well logging operations)

9. [REDACTED]
India
(oil and gas well logging operations)

10. [REDACTED]
India
(oil and gas well logging operations)

11. [REDACTED]
Angola
(oil and gas well logging operations)

12. [REDACTED]
India
(oil and gas well logging operations)

ULTIMATE CONSIGNEE(S) IN FOREIGN COUNTRY(IES) Continued:

13. [REDACTED]
Angola
(oil and gas well logging operations)

14. [REDACTED]
Angola
(oil and gas well logging operations)

SOURCES AUTHORIZED FOR SHIPPING TO ANGOLA

Total Number Of Sources	MAXIMUM PER SOURCE ACTIVITY	ISOTOPE	TOTAL MAXIMUM ACTIVITY OF ALL SOURCES FOR EACH ISOTOPE	END USE
14	2.1 Ci	[REDACTED]	150 mCi	Geographical Exploration Oil and Gas Well Logging
100	300 mCi	[REDACTED]	3 mCi	Geographical Exploration Oil and Gas Well Logging
12	19,200 nCi	[REDACTED]	1600 nCi	Geographical Exploration Oil and Gas Well Logging
12	6,000 nCi	[REDACTED]	500 nCi	Geographical Exploration Oil and Gas Well Logging
10	50 uCi	[REDACTED]	5 uCi	Geographical Exploration Oil and Gas Well Logging
10	25 uCi	[REDACTED]	2.5 uCi	Geographical Exploration Oil and Gas Well Logging
12	21.36 Ci	[REDACTED]	1.78 Ci	Geographical Exploration Oil and Gas Well Logging
12	18 Ci	[REDACTED]	1.5 Ci	Geographical Exploration Oil and Gas Well Logging
14	700 nCi	[REDACTED]	50 nCi	Geographical Exploration Oil and Gas Well Logging
14	700 nCi	[REDACTED]	50 Ci	Geographical Exploration Oil and Gas Well Logging
14	210 Ci	[REDACTED]	15 Ci	Geographical Exploration Oil and Gas Well Logging
14	266 Ci	[REDACTED]	19 Ci	Geographical Exploration Oil and Gas Well Logging
14	210 Ci	[REDACTED]	15 Ci	Geographical Exploration Oil and Gas Well Logging
17	8.5 Ci	[REDACTED]	500 mCi	Geographical Exploration Oil and Gas Well Logging

SOURCES AUTHORIZED FOR SHIPPING TO INDIA

Total Number Of Sources	MAXIMUM PER SOURCE ACTIVITY	ISOTOPE	TOTAL MAXIMUM ACTIVITY OF ALL SOURCES FOR EACH ISOTOPE	END USE
18	2 Ci	[REDACTED]	36 Ci	Geographical Exploration Oil and Gas Well Logging
10	19 Ci	[REDACTED]	190 Ci	Geographical Exploration Oil and Gas Well Logging
5	20 Ci	[REDACTED]	100 Ci	Geographical Exploration Oil and Gas Well Logging
14	15 Ci	[REDACTED]	210 mCi	Geographical Exploration Oil and Gas Well Logging
12	18 mCi	[REDACTED]	216 mCi	Geographical Exploration Oil and Gas Well Logging
12	55 mCi	[REDACTED]	600 mCi	Geographical Exploration Oil and Gas Well Logging

MANDATORY ADVANCED NOTIFICATIONS PER 10 CFR PART 110.50(c)

The following Advanced Notifications must be made to both the NRC and, in case of exports, the government of the importing country in advance of each shipment:

Mandatory Advanced Notifications to the NRC are to be emailed to hoo.hoc@nrc.gov (preferred method) or faxed to the NRC at 301-816-5151. In the subject line of the email or on the fax cover page include: "10 CFR 110.50(c) Notification." For technical assistance, use the same e-mail address or call 301-287-9056.

Mandatory Advanced Notifications to the government of the importing country must be emailed or faxed to the appropriate foreign government authorities. To locate the point-of-contact for international Advanced Notifications see: <http://www-ns.iaea.org/downloads/rw/imp-export/import-export-contact-points.pdf>. In the subject line of the email or on the fax cover page include: "NOTIFICATION TO THE IMPORTING STATE PRIOR TO SHIPMENT OF CATEGORY 1 OR 2 RADIOACTIVE SOURCES." For technical assistance or for countries not listed, contact the Office of International Programs' export/import staff at 301-287-9056.

Table 1: Appendix P to Part 110 Category 1 and Category 2 Radioactive Material Threshold Limits

Radioactive Material	Category 1		Category 2	
	Terabequerels (TBq)	Curies (Ci) ¹	Terabequerels (TBq)	Curies (Ci) ¹
Americium-241 (Am-241)	60	1,600	0.6	16
Americium-241/Beryllium (Am-241/Be)	60	1,600	0.6	16
Californium-252 (Cf-252)	20	540	0.2	5.4
Curium-244 (Cm-244)	50	1,400	0.5	14
Cobalt-60 (Co-60)	30	810	0.3	8.1
Cesium-137 (Cs-137)	100	2,700	1.0	27
Gadolinium-153 (Gd-153)	1,000	27,000	10.0	270
Iridium-192 (Ir-192)	80	2,200	0.8	22
Plutonium-238 ² (Pu-238)	60	1,600	0.6	16
Plutonium-239/Beryllium ² (Pu-239/Be)	60	1,600	0.6	16
Promethium-147 (Pm-147)	40,000	1,100,000	400	11,000
Radium-226 ³ (Ra-226)	40	1,100	0.4	11
Selenium-75 (Se-75)	200	5,400	2.0	54
Strontium-90 (Y-90)	1,000	27,000	10.0	270
Thulium-170 (Tm-170)	20,000	540,000	200	5,400
Ytterbium-169 (Yb-169)	300	8,100	3.0	81

Calculation of Shipments Containing Multiple Sources or Radionuclides:

The "sum of fractions" methodology for evaluating combinations of radionuclides being transported is to be used when import or export shipments contain multiple sources or multiple radionuclides. The threshold limit values used in a sum of the fractions calculation must be the metric values (i.e., TBq).

I. If multiple sources and/or multiple radionuclides are present in an import or export shipment, the sum of the fractions of the activity of each radionuclide must be determined to verify the shipment is less than the Category 1 or 2 limits of Table 1, as appropriate. If the calculated sum of the fractions ratio, using the following equation, is greater than or equal to 1.0, then the import or export shipment exceeds the threshold limits of Table 1 and the applicable security provisions of this part apply.

II. Use the equation below to calculate the sum of the fractions ratio by inserting the actual activity of the applicable radionuclides or of the individual sources (of the same radionuclides) in the numerator of the equation and the corresponding threshold activity limit from the Table 1 in the denominator of the equation. Ensure the numerator and denominator values are in the same units and all calculations must be performed using the TBq (i.e., metric) values of Table 1.

R1 = activity for radionuclides or source number 1 AR1 = activity limit for radionuclides or source number 1
R2 = activity for radionuclides or source number 2 AR2 = activity limit for radionuclides or source number 2
RN = activity for radionuclides or source number n ARN = activity limit for radionuclides or source number n

$$\sum_1^n \left[\frac{R_1}{AR_1} + \frac{R_2}{AR_2} + \frac{R_n}{AR_n} \right] \geq 1$$

¹ The values to be used to determine whether a license is required are given in TBq. Curie (Ci) values are provided for practical usefulness only and are rounded after conversion.

² The limits for exports of Pu-238 and Pu-239/Be can be found in § 110.21.

³ Discrete sources of Radium-226.