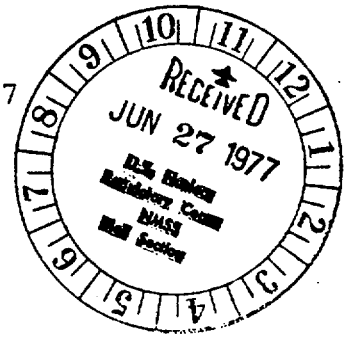
AtlanticRichfieldCompany

Harvey hnical Center
400 Eas. ibley Boulevard
Harvey, Illinois 60426
Telephone 312 333 3000

Products Division
Research & Engineering

Research & Development

June 23, 1977



U.S. Nuclear Regulatory Commission
Radioisotopes Licensing Branch
Div. of Fuel Cycle & Material Safety
Washington, D.C. 20655

Gentlemen:

Attached are two copies of NRC Form 313 appropriately supplemented for renewal of Byproduct Material License 12-00140-04. In this renewal we have combined our present license 12-00140-06 with 12-00140-04.

We trust that these forms are complete enough for your review.

Yours very truly,

A. I. Snow

A. I. Snow
Manager, Physical and
Environmental Research

AIS/ch
Attachments

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INSPECTION AND ENFORCEMENT

A184

Form AEC-313 (2-73) 10 CFR 30	UNITED STATES ATOMIC ENERGY COMMISSION **APPLICATION FOR BYPRODUCT MATERIAL LICENSE**	Form approved Budget Bureau No. 38-R0027

INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application or an application for renewal of a license. Information contained in previous applications filed with the Commission with respect to Items 8 through 15 may be incorporated by reference provided *references are clear and specific.* Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail two copies to: U.S. Atomic Energy Commission, Washington, D.C., 20545, Attention: Materials Branch, Directorate of Licensing. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20, and the license fee provisions of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 16 and the appropriate fee enclosed. (See Note in Instruction Sheet).

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital person, etc. Include ZIP Code and telephone number.)*

Atlantic Richfield Company
400 East Sibley Blvd.
Harvey, Illinois 60426

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1(a). Include ZIP Code.)*

Facilities owned or leased by subsidiaries of Atlantic Richfield throughout the United States except in Agreement States

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Any

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

12-00140-04 and amendments
12-00140-06 and amendments.

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

Dr. A. I. Snow, Manager, Physical and Environmental Research
L. A. Baillie, Senior Chemist
G. A. Uhl, Senior Engineer
J. D. Phelps, Jr. Asso. Engineer

5. RADIATION PROTECTION OFFICER. *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)*

Dr. A. I. Snow

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*

A. Hydrogen 3
B. Any byproduct material with Atomic Nos. between 3 and 83 inclusive.

CAmericium-241

(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*

Chemical and Physical Form - A. Any, B. Any.
Maximum amount of radioactivity which licensee may possess at any one time:

A. 100 curies
B. 1 curie except as follows.

Cobalt 60	25 curies
Iridium 192	25 curies
Krypton 85	50 curies
Strontium 90	100 millicuries
Promethium 147	10 curies

C. Foil (Nuclear Radiation Development Model A001) 600 microcuries

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)*

A & B. Research and Development as defined in Section 30.4(q) of Title 10, Chapter 1, Code of Federal Regulations, Part 30, "Rules of General Applicability to Licensing of Byproduct Material." 88264

C. To be used in a Mine Safety Appliances Billion Aire or similar analytical instruments. In accordance with Section 32.11, a specific license is requested for the following:

1. Introduction of H^3 and C^{14} compounds into gasoline and fuel oil.

32,11 (b) Description of Product - Gasoline and heating oil, including such products as jet fuel, diesel, No. 1

Continued on Page 2 Attached

(Continued on reverse side)

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 *(Use supplemental sheets if necessary)*

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	See attached sheet.		Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments			Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

9. EXPERIENCE WITH RADIATION. *(Actual use of radioisotopes or equivalent experience.)*

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
See attached sheet.				

10. RADIATION DETECTION INSTRUMENTS. *(Use supplemental sheets if necessary.)*

TYPE OF INSTRUMENTS *(Include make and model number of each)*	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE *(mr/hr)*	WINDOW THICKNESS *(mg/cm^2)*	USE *(Monitoring, surveying, measuring)*
See attached sheet.					

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

At least every 6 months and more frequently when used.

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. *(For film badges, specify method of calibrating and processing, or name of supplier.)*

FilmBadges and thermoluminescent ring dosimeters - R. A. Landauer, two-week intervals.
Tritium Bio-assays - New England Nuclear

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS IN DUPLICATE

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. *(Circle answer)* (Yes) No

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. Atomic Disposal Co., Inc.

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

License Fee Category $ _____

Fee Enclosed $ _____

Atlantic Richfield Co.
Applicant named in item 1

By: R. I. Amos

Date 6/24/77

Manager, Physical & Environmental Research
Title of certifying official

WARNING.—18 U. S. C., Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

* U.S. GPO: 1973—543-126/515

7 A & B continued

heating oil, No. 2 heating oil and No. 6 heating oil.

Intended Use of Byproduct - Radioactive tracer tests to measure heat exchanger leakage and flow distribution in gasoline production units and heating oil catalytic hydrogenation units.

Intended Use of Product Into which Introduced - Sold commercially as gasoline and fuel oil.

Method of Introduction - Radioactive tracer is injected as a pulse at the entry to a process unit. In general the radioactive material is contained in a metal vessel or pipe, and is flushed into the system with inert liquid greatly in excess of the volume of the tracer.

Initial Concentration of Byproduct Material in the Product - Concentration will be below 3×10^{-2} microuries per ml. Hydrogen -3 or 8×10^{-3} microcuries per ml. Carbon -14 as given in 30.70.

Control Methods to assure that no more than specified concentration is introduced - The flow rates of feed and product in the processing unit are known. The volume of the blending tanks is known in advance. The amount of tracer per test is accurately measured by the use of a calibrated liquid scintillation spectrometer before introduction into the process unit. Test of byproduct material concentration in the final tank is determined by calculation, and later by analysis. Time interval between introduction and transfer of the product and material is two to seven days.

Estimated Concentration of Radioisotopes in Product at Time of Transfer - The amount varies with the test. Minimum practical amount is always used and always less than exempt concentration, 8×10^{-3} μc/ml carbon 14 or 3×10^{-2} μc/ml hydrogen 3.

32.11 (c) Provide reasonable assurance that the concentrations of byproduct material at the time of transfer will not exceed the concentrations in 30.70.

Total quantity used is actually measured in advance. Amount appearing is checked by line samples of effluent from unit concerned. Reconcentration of byproduct material in concentrations exceeding 30.70 are unlikely. Distillation properties of the tracer containing compounds is such that reconcentration is extremely unlikely in this intended use. Reconcentration is only possible with extremely precise distillation fractions which require extremely specialized equipment. 88264

Assurance that Use of Lower Concentration is not Feasible.

Our policy is to use lowest practical concentrations and of obtaining accurate measurements. In the use of Carbon 14, cost of the tracer is important. We have had enough experience over many years for this general

type of application that our calculations of tracer concentration of the product are quite accurate in advance of the test.

Assurance that the product is not likely to be incorporated in any food, beverage, cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

Since the products here are fuels, it is not likely that they will be incorporated in any food, beverage, cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

2. Introduction of Co-60, Gold-198 or Scandium-46 compounds into asphalt, heavy fuel oil, No. 6 fuel, Bunker "C" fuel or petroleum coke.

32.11 (b) Description of Product

Asphalt, heavy fuel oil, No. 6 fuel, Bunker "C" fuels and petroleum coke.

Intended Use of Byproduct.

Tracer tests in vacuum towers or cokers to measure entrainment, mixing, volume, flow rates, etc.

Intended Use of Product into which Introduced

See above.

Method of Introduction.

Injected into feed or recycle to a processing unit. All these tracers are non-volatile, and will appear in bottoms or coke.

Initial Concentration of Byproduct Material in the Product

Cobalt^{60} - less than 5×10^{-4} µc/ml.

Gold^{198} - less than 5×10^{-4} µc/ml.

Scandium^{46} - less than 4×10^{-4} µc/ml.

Control Methods to Assure that No More Than Specified Concentration is Introduced

Measured amount introduced, process unit effluent sampled. Our tests depend upon knowing how much is introduced.

Estimated Time between Introduction and Transfer

Two to seven days.

Estimated Concentration of Radioisotopes in Product at Time of Transfer

Varies with test, minimum practical will be used, always less than exampt concentration.

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32.11 (c) Provide Reasonable Assurance that the Concentrations of Byproduct Material at the Time of Transfer will not Exceed the Concentrations in 30.70.

Total quantity of tracer used is measured in and checked

by unit effluent samples. Reconcentration of byproduct material in concentration exceeding 30.70 unlikely. Gold colloid is very stable when contained in asphalt and will not settle out or concentrate. Gold colloid in coke is dispersed in a solid phase so that gold atoms will not combine and concentrate. Co^{60} and Sc^{46} as oil soluble compounds will remain dispersed in liquid fuel, or as solids in coke.

Assurance that Use of Lower Concentrations is Not Feasible

Will use lowest practical concentration. Concentration depends upon type of tracer test made.

Assurance that the Product is not Likely to be Incorporated in any Food, Beverage, Cosmetic, Drug or other Commodity or Product Designed for Ingestion or Inhalation by, or Application to, a Human Being

Since the products here are fuels, it is not likely they will be incorporated in any food, beverage, cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

3. Introduction of H^3 and Carbon-14 compounds and Kr85 into fuel gas.

32.11 (b)

Description of Product

Fuel gas.

Intended use of Byproduct

Radioactive tracer tests to measure flow rates, flow distribution in process units involving a gas phase.

Intended use of Product into which Introduced.

Sold commercially as hydrogen rich gas or as fuel gas.

Method of Introduction

Radioactive tracer is injected as a pulse at the entry of a process unit. In general the radioactive material is contained in a metal vessel, and is flushed into the system with inert gas greatly in excess of the volume of the tracer.

Initial Concentration of Byproduct Material in the Product

Concentration will be below 5×10^{-6} microcuries per ml. for hydrogen -3, 1×10^{-6} microcuries per ml. for carbon-14 or 3×10^{-6} microcuries per ml. for Krypton-85.

Control Methods to Assure that no more than specified Concentration is introduced.

The flow rates are approximately known, and conservative calculations will be used. The volume of blending and surge tanks is known in advance. The amount of tracer per test is accurately measured by assay. Determination of byproduct material concentration in the final product is determined by calculation and later checked by analysis.

Estimated Time between Introduction and Transfer

Less than one day.

Estimated Concentration of Radioisotopes in Product at Time of Transfer

Varies but minimum practical will be used, always less than exempt concentration.

32.11 (c) Provide Reasonable Assurance that the Concentrations of Byproduct Material at the Time of Transfer will not Exceed the Concentrations in 30.70.

Total quantity of tracer used is measured in and checked by unit effluent samples.

Assurance that use of lower concentrations is not feasible.

Will use lowest practical concentration, always less than the exempt concentration.

Assurance that the product is not likely to be incorporated in my food, beverage, cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

Since the products here are fuels, it is not likely that they will be incorporated in any food, beverage, cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

8. A. I. Snow

a.	Ames Laboratory of the AEC	7 years	yes	yes
	University of Chicago	2 years		
	Sinclair Research, Inc. & Atlantic Richfield Company	22 years		
b.	Ditto	31 years	yes	yes
c.	Ditto	31 years	yes	yes
d.	Ditto	31 years	yes	yes

Lloyd A. Baillie

a.	Argonne Cancer Research Hosp.	1 year	yes	no
	Sinclair Research, Inc. & Atlantic Richfield Company	21 years	yes	no
b.	Ditto	21 years	yes	no
c.	South Dakota State College	5 years	no	yes
	DePaul University			
	Sinclair Research, Inc. & Atlantic Richfield Co.	21 years	yes	no
d.	Argonne Cancer Research Hosp.	1 year	yes	no
	Sinclair Research, Inc. & Atlantic Richfield Company	21 years	yes	no

George A. Uhl

a.	University of Michigan	3 weeks	no	yes
b.	Sinclair Research, Inc. & Atlantic Richfield Company	21 years	yes	no
c.	Ditto	21 years	yes	yes
d.	Ditto	21 years	yes	yes

John D. Phelps Jr.

a.	Illinois Inst. of Tech.	5 Mos.	No	Yes
	Argonne National Laboratory	2 years	Yes	No
	Atlantic Richfield Co.	4 years	Yes	No
b.	Illinois Inst. of Tech.	5 mos.	No	Yes
	Argonne National Laboratory	2 years	Yes	No
	Atlantic Richfield Co.	4 years	Yes	No
c.	Illinois Inst. of Tech.	5 mos.	No	Yes
	Atlantic Richfield Co.	4 years	Yes	No
d.	Illinois Inst. of Tech.	5 mos.	No	Yes
	Argonne National Laboratory	2 years	Yes	No
	Atlantic Richfield Co.	4 years	Yes	No

9. A. I. Snow

Natural Uranium	many pounds	Ames Laboratory of the AEC	7 years	Metallurgy
Natural Thorium	many pounds	Ames Laboratory of the AEC	7 years	Metallurgy
CO-60	17000 curies	Sinclair Rsch. Inc. & Atlantic Rich.Co.	21 years	Rad. Sourc
Fe-59	100 mc	Ditto	13 years	Wear Test:
Sc-46	100 mc	Ditto	6 years	Tracer Te: in Refine:
Au-198	1 curie	Ditto	8 years	Tracer Te: with Cat.
C-14	40 millicuries	Ditto	15 years	Tracer Te:
P-32	100 millicuries	Ditto	4 years	Tracer Te:
Ni63	100 millicuries	Sinclair Rsch. Inc. & Atlantic Rich. Co.	10 years	Tracer Te:
S-35	20 millicuries	Ditto	3 years	Tracer Te:
H-3	100 curie	Ditto	15 years	Tracer Te:
Ra-226	3 millicuries	Ditto	5 years	Calibrati Sources
Sr-Y-90	3 millicuries	Ditto	7 years	Measuring C/H Ratio:
As-76	2 millicuries	Ditto	1 year	Tracer
Ca-64	2 millicuries	Ditto	1 year	Tracer

Cs-137	0.5 curie	Ditto	10 years	External Source
Kr-85	1 curie	Ditto	12 years	Gas Tracer
Ta-182	50 millicuries	Ditto	5 years	Wear Tests
Lloyd A. Baillie				
Fe-59	100 mc	Sinclair Rsch. Inc. & Atlantic Rich. Co.	16 years	Tracer & Wear Tests
Sc-46	100 mc	ditto	21 years	Tracer Tests in Refinery
Fe-55	5 curies	ditto	16 years	Wear Tests
Au-198	1 curie	ditto	21 years	Tracer Tests
Cs-137	0.5 curies	ditto	21 years	External Source
Ni-63	100 millicuries	ditto	16 years	Tracer
H-3	100 curies	ditto	21 years	Tracer tests
C-14	40 millicuries	ditto	21 years	Tracer tests
Kr-85	1 curie	ditto	12 years	Tracer tests
CO-60	17000 curies	ditto	18 years	Radiation Sourc
I-131	50 curies	Argonne Cancer Rsch. Hospital	1 year	Medical
P-32	5 curies	ditto	1 year	Medical
George A. Uhl				
Sc-46	100 mc	Sinclair Rsch. Inc. & Atlantic Richfield Co.	21 years	Tracer Tests
Kr-85	1 curie	ditto	12 years	Tracer Tests
Au-198	1 curie	ditto	21 years	Tracer Tests
C-14	40 millicuries	ditto	21 years	Tracer Tests
Co-60	17000 curies	ditto	18 years	Rad. Source
Cs-137	1 curie	ditto	21 years	External source
H-3	100 curies	ditto	21 years	Tracer Tests
John D. Phelps, Jr.				
U-238	500μC	Argonne Nat'l Lab	1 year	Metallurgy
Co-60	2500 C	Atlantic Richfield	3 years	Radiation sourc

Ir-192	15c	ditto	1 year	Radiation sourc
Cs-137	7mc	ditto	1 year	Radiation sourc
Am-241	600μC	ditto	3 years	Radiation sourc
Sc-46	100 mc	ditto	4 years	Tracer Tests Lab & Refinery
Au198	100 mc	ditto	4 years	Tracer Tests

H-3	250mc	ditto	4 year	Tracer test
I-131	5 mc	ditto	1 year	Tracer Test
C-14	1 mc	ditto	2 years	Tracer test
Cl-36	4 mc	ditto	1 year	Tracer test
Mo-99	100 mc	ditto	1 year	Tracer test
Ba-140/ La-140	10 mc	ditto	1 year	Tracer test

10.

Nuclear measurements	GS-3cD	1	gamma	0-50	(35)	Survey
Nuclear Chicago	2612	2	beta-gamma	0-20	1.4	Survey
Baird Atomic	420	1	gamma	0-100	(30)	Survey
Nuclear Chicago	9122	1	gamma	0-20000	-	Survey
Tracerlab	SU-IE	1	beta-gamma	0-1500	3	Survey
Eberline	E-530	1	gamma	0-200	0.5	Survey
Nuclear Chicago	2586	1	beta-gamma	0-2500	3	Survey
Eon	PSM-700	3	gamma	0-50		Survey
Nuclear Chicago	D-47	2	beta			Measure
Ditto	181A	1				"
Ditto	192A	1				"
Ditto	1613A					"
Ditto	1619	1				"
Ditto	1620	2				"
Ditto	1810	2				"
Ditto	6000	1				"
Baird Atomic	125B	3				"
Packard Tricarb	3214	1	beta			"
Beckman Beta-Mate	163960	1	beta			"