



Pacific Northwest Laboratories

P. O. Box 999

Richland, Washington 99352

Telephone (509) 942-5664

Telex 526345

October 17, 1979

TO: Dr. Donald Solberg, Systems Performance Branch, NRC  
FROM: David Robertson, Battelle, Pacific Northwest Laboratory

PROJECT

TITLE: Characterization of Radionuclide Contamination Throughout Light  
Water reactor Power Stations

Progress Report for September, 1979

Site Selections, Contacts and Visits

The program is getting off to a good start. Two of the three utilities we have petitioned have agreed to cooperate with us for initiating our program at reactors which are shut down or on a standby basis. Northern States Power Company, headquartered in Minneapolis, has agreed to let us study the Pathfinder Atomic Power Plant in Sioux Falls, South Dakota, and Consolidated Edison Company of New York has given permission to study the Indian Point Station, Unit 1, which is about 25 miles north of New York City at Buchanan. Pacific Gas and Electric Company, headquartered in San Francisco, turned down our request to study the Humbolt Bay Power Plant near Eureka, California. Attached are copies of our letters of request and the reply letters from the utilities. I plan to follow up with Pacific Gas and Electric Company to see if they will reconsider our request now that other utilities have cooperated.

We have planned visits with Northern States Power Company and Consolidated Edison Company of New York to discuss our program with them in detail and to tour the reactor sites. We will meet with Mr. E. C. Ward, Manager - Nuclear Environmental Services with Northern States Power Company in Minneapolis at 1:30 P.M. on Thursday, October 25, 1979. We will then tour the Pathfinder Plant in Sioux Falls the next morning, on Friday, October 26, 1979.

NRC Research and Technical  
Assistance Report

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OCT 30 1979

INTERIM REPORT

Accession No. \_\_\_\_\_

Contractor's Report No. \_\_\_\_\_

Contract Program or Project Title: Characterization of Radionuclide

Contamination Throughout Light Water Reactor Power Stations

Subject of this Document: Progress reported for September 1979

Type of Document: Informal monthly letter progress report

Author(s): David Robertson

Date of Document: October 17, 1979

Responsible NRC Individual and NRC Office or Division: \_\_\_\_\_

Donald E. Solberg, Chief, Systems Performance Research Branch, SAFER:RES

This document was prepared primarily for preliminary or internal use. It has not received full review and approval. Since there may be substantive changes, this document should not be considered final.

Prepared By  
Battelle  
Pacific Northwest Laboratories  
P.O. Box 999  
Richland, Washington 99352

Prepared for  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

NRC FIN No. B2299

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J. D. Davis

1323 019

NRC Research and Technical  
Assistance Report  
INTERIM REPORT

~~701-130-095~~

October 17, 1979

We will meet with Mr. Stephen Sadlon, Supervisor - Nuclear Environmental Monitoring, with Consolidated Edison at their Indian Point Station at Buchanan, New York (about 25 miles up the Hudson River from New York City), at 9:00 A.M. on Tuesday, October 30, 1979 and then tour Unit 1 the same afternoon.

We would plan to begin our measurement program at these sites within a month or two after our initial visits.

#### Literature Search

The literature search has been under way for two months. We are piecing together the available information on residual radionuclide concentrations and distributions within nuclear power plants. Much of the data are in the form of estimates or calculated inventories, rather than measured quantities, and thus point out the need for a measurements program. The utilities appear to possess a great deal of in-house information which is not generally available to the public. I plan to write to all of the utilities operating nuclear power plants to request any in-house data or publications on radionuclide concentrations and distributions within their power plants.

#### Instrument Procurement

We are purchasing a very versatile field-model intrinsic germanium gamma-ray spectrometer from Princeton Gamma Tech. This detector is very portable, and can be used in omni-directional counting configurations for surveying horizontal, vertical or angled structures within a power plant. We expect to have this spectrometer delivered in about one month. We should have a complete, portable counting system ready to go in two months. We plan to begin the on-site measurements program as soon as this system is ready.

#### Costs Incurred

As of 9-30-79 we have spent \$33,858, broken down as follows:

Direct Labor Costs	\$13,523
Procurements	1,292
Travel	1,226
Facilities & Equipment	3,564
Other Costs	16
Labor Overheads	12,441
Total Cost Overheads/Fee	<u>1,796</u>
Total	\$ 33,858

1323 020

**NSP**

**NORTHERN STATES POWER COMPANY**

(612)

330-5500

MINNEAPOLIS MINNESOTA 55401

October 2, 1979

Mr D E Robertson  
Senior Research Scientist  
Earth and Planetary Chemistry Section  
Physical Sciences Department  
Battelle Pacific Northwest Laboratories  
P O Box 999  
Richland, Washington 99352

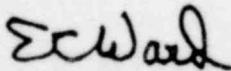
Dear Mr Robertson:

Pathfinder Generating Plant

Our letter of September 12 conveyed overview information on the Pathfinder decommissioning and was furnished in connection with your inquiry about including the Pathfinder Plant in a study program that you are conducting under contract with the Nuclear Regulatory Commission (NRC). We trust the information has been helpful and perhaps has enhanced your planning for including the Pathfinder Plant in the study.

Our responsible personnel have reviewed the information furnished with your September 4 letter which outlined some of the basics and objectives of your program. The consensus is that NSP is interested in pursuing the program and we propose to take up your offer to come to Minneapolis to discuss in greater detail the various phases of the program. For a meeting schedule, we propose a day about the middle of October (except October 18). After you've had a chance to review the availability of your people we can establish a firm date by telephone contact.

Yours very truly,



E C Ward, PE  
Manager-Nuclear Environmental Services

1323 021

ECW/jh

William J. Cahill, Jr.  
Vice President

Consolidated Edison Company of New York, Inc.  
4 Irving Place, New York, N Y 10003  
Telephone (212) 460-3819

September 27, 1979

Mr. D.E. Robertson, Senior Research  
Scientist  
Earth and Planetary Chemistry Section  
Physical Sciences Department  
Battelle Pacific Northwest Laboratories  
P.O. Box 999  
Richland, Washington, 99352

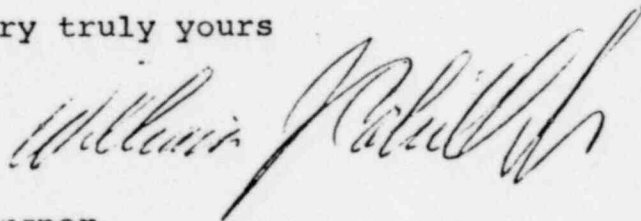
Dear Mr. Robertson

In response to your letter dated September 4, 1979, Consolidated Edison is requesting that Indian Point Unit 1 be included in the radionuclide characterization program. We are prepared to cooperate with the conduct of this program. We have assigned Mr. Stephen Sadlon to work with you. Mr. Sadlon is currently the Nuclear Environmental Monitoring Supervisor. Prior to his being in this position, he had extensive experience at Unit No. 1 in the health physics field.

Mr. Sadlon will be available to the program during the months of November and December. He can be reached on (914) 694-6000, Ext. 368 or (914) 737-2290 (direct line).

If I can be of any further assistance at this time please feel free to contact me.

Very truly yours



CC: Mr. Arthur A. Kressner

1323 022

# PACIFIC GAS AND ELECTRIC COMPANY

PG&E + 77 BEALE STREET • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4211 • TWX 910-372-6587

September 6, 1979

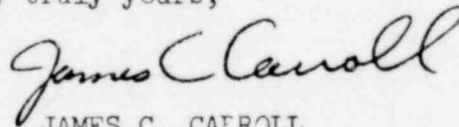
Mr. D. E. Robertson  
Senior Research Scientist  
Physical Sciences Department  
Battelle Pacific Northwest  
Laboratories  
P.O. Box 999  
Richland, WA 99352

Dear Mr. Robertson:

We have reviewed the request in your letter dated August 10 concerning the use of the Humboldt Bay Power Plant Unit No. 3 for measuring residual radioactivity to establish guidelines and policies for decontamination and decommissioning nuclear power plants. Because of previous commitments of our personnel, in part as a result of issues raised by the accident at Three Mile Island, we are not able to cooperate with you in this endeavor.

Thank you for your interest in considering our Humboldt Bay Power Plant, and we hope conditions will allow us to work with you on other projects in the future.

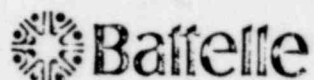
Very truly yours,



JAMES C. CARROLL  
Steam Supervising Engineer  
Steam Generation Department  
Electric Operations

JCC:lt

1323 023



Pacific Northwest Laboratories

P. O. Box 999

Richland, Washington 99352

Telephone (509) 942-5664

Telex 32 6345

September 4, 1979

Mr. E. C. Ward  
Manager, Nuclear Environmental Services  
Nuclear Support Services  
Northern States Power Company  
414 Nicolet Mall, 8th Floor  
Minneapolis, Minnesota 55401

Dear Mr. Ward:

Following our telephone conversation of September 4, 1979, this letter will document our desire to include the Pathfinder Atomic Power Plant in our reactor decommissioning program. Although Pathfinder has been partially decommissioned I believe the plant can still be of great value to our program objectives.

As I mentioned to you on the phone, the Nuclear Regulatory Commission (NRC) has contracted with Battelle-Northwest Laboratory to conduct a study which will characterize the radionuclide inventory and distribution within a number of nuclear power plants. The primary objective of this work is to determine what residual radioactivity is present in nuclear power plants at or near the time of shutdown so that guidelines and policies can be formulated by the NRC for the decontamination and decommissioning (D & D) of retired power plants. I have included a summary of the scope of this program and the work plan which includes measurements of residual radionuclides both within the plant and in its immediate environs. We plan to initiate our study at several reactors which are presently shut down and then extend it to a number of other plants.

Based on a study of nuclear power reactors which are currently out of service, together with consultations with NRC representatives, we feel that the Pathfinder Atomic Power Plant and its environs should be included in this program. We therefore request the approval of the Northern States Power Company to conduct this radionuclide characterization program at the Pathfinder Plant. This study would include on-site radionuclide measurements utilizing a portable gamma-ray spectrometer and a beta detector system. It is also important to obtain samples of piping, structural materials, concrete, etc. for more detailed analysis of residual radioactivity at our Richland, Washington laboratory. We plan to emphasize the analyses of the long-lived (half-lives over six months) radionuclides, including the transuranics (Pu, Am, Cm) and low energy beta and X-ray emitters ( $^{99}\text{Tc}$ ,  $^{129}\text{I}$ ,  $^{63}\text{Ni}$ , etc.).

In order to successfully carry out this work, we will need both your permission and cooperation. This would include the assignment of a responsible officer

1323 024

September 4, 1979

from your organization with whom we may work. Since this is a rather complex program we feel that a discussion with appropriate members of the Northern States Power Company would be appropriate. We would be happy to come to Minneapolis to discuss in greater detail the various phases of the program at your convenience.

Our Laboratory has been very active for a number of years in the field of decontamination, decommissioning and environmental work for all phases of the nuclear industry and is well qualified to conduct this work. I'm sure that you recognize the importance of formulating advance strategies and policies for permanently retiring nuclear plants. We believe that this study at the Pathfinder Atomic Power Plant will also prove beneficial to the Northern States Power Company in time, effort and resources as NRC decommissioning criteria are formulated, since the program will provide many of the essential measurements for eventual decontamination and decommissioning.

We look forward to a favorable reply to this request. If you have any questions concerning this program, feel free to call me on 509-942-5664 or J. S. Fruchter, 509-942-3937.

Thank you for your consideration in this matter.

Sincerely,



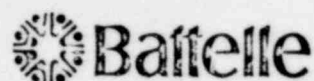
D. E. Robertson  
Senior Research Scientist  
Earth and Planetary Chemistry Section  
PHYSICAL SCIENCES DEPARTMENT

DER/bg

Enclosure

1323 025





Pacific Northwest Laboratories

P. O. Box 999

Richland, Washington 99352

Telephone (509) 942-5664

Telex 32-6345

September 4, 1979

Mr. W. J. Cahill, Jr.  
Consolidated Edison Company  
4 Irving Place  
New York, New York 10003

Dear Mr. Cahill:

The Nuclear Regulatory Commission (NRC) has contracted with Battelle-Northwest Laboratory to conduct a study which will characterize the radionuclide inventory and distribution within a number of nuclear power plants. The primary objective of this work is to determine what residual radioactivity is present in nuclear power plants at or near the time of shutdown so that generic, national guidelines and policies can be formulated by the NRC for the decontamination and decommissioning (D & D) of retired power plants. I have included a summary of the scope of this program and the work plan which includes measurements of residual radionuclides both within the plant and in its immediate environs. We plan to initiate our study at two reactors which are presently shut down and then extend it to several other plants.

Based on a study of nuclear power reactors which are currently out of service together with consultations with NRC representatives, we feel that the Indian Point Station, Unit 1 should be included in this program. We therefore, request the approval of Consolidated Edison to conduct this radionuclide characterization program at Indian Point Station, Unit 1. This study would include on-site radionuclide measurements utilizing a portable gamma-ray spectrometer and a beta detector system. It is also important to obtain samples of opportunity, including piping, structural materials, concrete, etc. for more detailed analysis of residual radioactivity at our Richland, Washington laboratory. We plan to emphasize the analyses of the long-lived (half-lives over six months) radionuclides, including the transuranics (Pu, Am, Cm) and low energy beta and X-ray emitters ( $^{99}\text{Tc}$ ,  $^{129}\text{I}$ ,  $^{63}\text{Ni}$ , etc.).

Our on-site measurements work will involve 2 or 3 of our personnel and we would expect to be on-site for approximately 8 to 10 days. The typical in-plant areas that would be examined will include the secondary loop system (steam generator, turbine and condenser), the liquid rad-waste processing system, miscellaneous liquid processing systems, the gaseous waste system, the solid waste system, stacks, the fuel storage basin, decontamination areas, and the floors, walls and structural materials in rooms housing these systems. The typical external plant areas that will be examined will include the cooling towers, trenches, ponds, low-level rad-waste discharge areas, and soils within the site boundary. We recognize that

1323 026

September 4, 1979

the Indian Point Station has two presently operating nuclear plants in Units 2 and 3, and any plans for making radionuclide measurements external to Unit 1 will need to consider the possible effects of these operating units. We will not, however, be making any measurements within Units 2 and 3.

In order to successfully carry out this work, we will need both your permission and cooperation. This would include the assignment of a responsible officer from your organization with whom we may work. Since this is a rather complex program we feel that a discussion with appropriate members of Consolidated Edison would be appropriate. We would be happy to come to New York to discuss in greater detail the various phases of the program at your convenience.

Our laboratory has been very active for a number of years in the field of decontamination, decommissioning and environmental work for all phases of the nuclear industry and is well qualified to conduct this work. I'm sure that you recognize the importance of formulating advance strategies and policies for permanently retiring nuclear plants. We believe that this study at the Indian Point Station, Unit 1, will also prove beneficial to Consolidated Edison in time, effort and resources as NRC decommissioning criteria are formulated, since the program will provide many of the essential measurements for eventual decontamination and decommissioning.

We look forward to a favorable reply to this request. If you have any questions concerning this program, feel free to call me on 509-942-5664 or J. S. Fruchter, 509-942-3937.

Thank you for your consideration in this matter.

Sincerely,



D. E. Robertson  
Senior Research Scientist  
Earth and Planetary Chemistry Section  
PHYSICAL SCIENCES DEPARTMENT

1323 027

DER:bg

Enclosure



Pacific Northwest Laboratories  
P.O. Box 999  
Richland, Washington U.S.A. 99352  
Telephone (509)  
Telex 15-2874

August 10, 1979

Mr. Jay Carroll  
Steam Generation Department  
Nuclear Overview  
Pacific Gas and Electric Company  
77 Beale Street  
San Francisco, California 94106

Dear Mr. Carroll:

The Nuclear Regulatory Commission (NRC) has contracted with Battelle-Northwest Laboratory to conduct a study which will characterize the radionuclide inventory and distribution within a number of nuclear power plants. The primary objective of this work is to determine what residual radioactivity is present in nuclear power plants at or near the time of shutdown so that guidelines and policies can be formulated by the NRC for the decontamination and decommissioning (D & D) of retired power plants. I have included a summary of the scope of this program and the work plan which includes measurements of residual radionuclides both within the plant and in its immediate environs. We plan to initiate our study at two reactors which are presently shut down and then extend it to several other plants.

Based on a study of nuclear power reactors which are currently out of service together with consultations with NRC representatives, we feel that the Humbolt Bay Power Plant and its environs should be included in this program. We therefore, request the approval of Pacific Gas and Electric Company to conduct this radionuclide characterization program at Humbolt Bay. This study would include on-site radionuclide measurements utilizing a portable gamma-ray spectrometer and a beta detector system. It is also important to obtain samples of piping, structural materials, concrete, etc. for more detailed analysis of residual radioactivity at our Richland work laboratory. We plan to emphasize the analyses of the long-lived (half-lives over six months) radionuclides, including the transuranics (Pu, Am, Cm) and low energy beta and X-ray emitters ( $^{99}\text{Tc}$ ,  $^{129}\text{I}$ ,  $^{63}\text{Ni}$ , etc.).

In order to successfully carry out this work, we will need both your permission and cooperation. This would include the assignment of a responsible officer from your organization with whom

1323 028

we may work. Since this is a rather complex program we feel that a discussion with appropriate members of PG & E would be appropriate. We would be happy to come to San Francisco and discuss in greater detail the various phases of the program at your convenience.

Our laboratory has been very active for a number of years in the field of decontamination, decommissioning and environmental work for all phases of the nuclear industry and is well qualified to conduct this work. I'm sure that you recognize the importance of formulating advance strategies and policies for permanently retiring nuclear plants. We believe that this study at the Humbolt Bay Power Plant will also prove beneficial to PG & E in time, effort and resources as NRC decommissioning criteria are formulated, since the program will provide many of the essential measurements for eventual decontamination and decommissioning.

We look forward to a favorable reply to this request. If you have any questions concerning this program, feel free to call me on 509-942-5664 or J. S. Fruchter, 509-942-3937.

Thank you for your consideration in this matter.

Sincerely,

*Daw Robertson*  
*by cms*

D. E. Robertson  
Senior Research Scientist  
Earth and Planetary Chemistry Section  
PHYSICAL SCIENCES DEPARTMENT

DER/cms

Enclosure

1323 029

ENCLOSURE

SAFER PROJECT BRIEF

TITLE: CHARACTERIZATION OF RADIONUCLIDE  
CONTAMINATION THROUGHOUT LIGHT  
WATER REACTOR POWER STATIONS

February 28, 1979

FIN NO.: B-2299  
CONTRACTOR: PNL

RES LEAD BRANCH: Systems Performance Branch

SITE: Richland  
STATE: Washington

RES PROJECT MANAGER: Donald E. Solberg

PERIOD OF WORK: 4/1/79 - 9/30/79

FY79 OBLIG: \$100K

Principal Investigators:

R. I. Smith  
D. E. Robertson

RES REQUEST ID: OSD 78-8

OBJECTIVE:

The objective of this project is to determine the nature, distribution and inventory of residual radionuclide contamination in and around commercial light water nuclear power stations as a function of important design and operating parameters. These data are being obtained to aid NRC in formulating policies and strategies for decommissioning of nuclear power plants.

SCOPE:

Residual radioactivity will be determined experimentally in all appropriate areas of selected PWRs and BWRs, except for the biological shield, reactor vessel and internals which are being investigated in another project (FIN no. B-2296). Samples will be obtained from appropriate reactor components, structures and plant environs at both shut down and operating nuclear power plants. These samples will be analyzed for radionuclides with half lives greater than about 1 year to determine the types of radionuclides present, their form, quantities and distribution both throughout the plant and within the material matrix where they are found. All samples will be analyzed for major gamma-emitting radioisotopes and a few samples from each power plant site will undergo radiochemical separations to determine trace gamma emitting radionuclides, beta emitting radionuclides and transuranics. Plant design and operational data will be obtained and attempts made to correlate these data with observed contamination levels. Analysis models will be formulated which will enable prediction of the nature and distribution of radionuclides in and around LWRs as functions of important design and operating conditions. These models will permit the NRC staff to make better assessments of the costs, radiation exposure and technology required for decontaminating and dismantling nuclear power plants, and restoring the reactor sites to an environmentally acceptable condition.

1323 030

FY79 GUIDANCE:

Implement the FY79 scope as defined in item 22 of draft 189a submitted by letter from Rancitelli to Solberg dated February 21, 1979, and as summarized below:

TASK 1: LITERATURE REVIEW

Conduct a literature search to obtain available data on the nature and distribution of radionuclides within standby and operating LWRs and in their immediate environs. Prepare a draft report of the results.

TASK 2: MEASUREMENT PLAN

Make initial contacts at power plant sites of interest to this study to obtain preliminary indication of cooperative interest. Based on literature study and the reactor decommissioning studies performed by PNL, prepare and issue the draft of a general plan for obtaining and analyzing samples and identifying the design and operating data needed for evaluation of these results. Negotiate with plant sites and select ~~one~~ <sup>two</sup> standby site for making the first measurements. Meet with site personnel and develop the site-specific measurement plan.

TASK 3: SAMPLE ACQUISITION AND ANALYSIS

Survey areas of the plants which are of interest to this study with the portable Ge(Li) gamma spectrometer and a low level beta counter. Survey and intensive sampling will be initiated throughout the plant. Spectrometric analyses will be performed on all samples to quantitatively determine the presence of long-lived gamma emitters. Selected samples will be quantitatively analyzed radiochemically for transuranics, beta emitters and trace gamma emitters. Duplicate samples will be obtained for the <sup>standby</sup> sites or for use in a planned decontamination study. Operating and <sup>design</sup> data will also be collected to assist in performing Task 4.

TASK 4: SITE-SPECIFIC DATA ASSESSMENT

Work in this task will consist mainly in identifying the nature of plant design and operating data which must be collected at the site to perform the data assessment.

If data are available, initial assessment may begin this fiscal year.

TASK 5: PREDICTIVE MODEL DEVELOPMENT

Work in this task during the fiscal year will be restricted to providing input to the other tasks to maximize benefit to model development.

*Task 6: Monthly progress letters - complete B-topical report*