UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JUL 21 1982

National Bureau of Standards
Center for Analytical Chemistry
Gas and Particulate Source Division
ATTN: Dr. Harry Rook, Chief
Washington, DC 20234

Subject: Interagency Agreement No. RS-NRR-82-126

Gentlemen:

Pursuant to the authority contained in the Economy Act of 1932, as amended, 31 USC 686, the U.S. Nuclear Regulatory Commission (NRC) and the National Bureau of Standards (NBS) desire to enter into an interagency agreement whereby NBS will provide services to evaluate the various concepts and interpretations of Lower Limit Detection (LLD) presented in the literature, to determine the current use and application of these concepts in practice in technical specifications for operating nuclear plants, and to develop a NUREG document defining and elaborating the NRC position relative to LLD's.

Accordingly, the parties hereto mutually agree to the following terms of this agreement:

Article I - PERIOD OF PERFORMANCE

The period of performance shall be from the effective date of this agreement through 18 months thereafter.

Article II - SCOPE OF WORK

Background

The concept of Lower Limit of Detection (LLD) is used routinely in the NRC Radiological Effluent Technical Specifications (RETS) for measurement of radiological effluent concentrations within the plant and of radiological environmental samples outside of the plant. The definition of LLDs is subject to different interpretations by various groups and often presents a major point of contention between the licensee and the NRC. At present NRC relies on documentation on LLDs that has been developed by other agencies for their own purposes, is for the most part difficult to obtain, and is only partially relatable to Technical Specifications requirements. This document is needed to provide guidance to licensees in preparing updated Technical Specifications that implement Appendix I to 10 CFR Part 50.

Objective

The objective of this project is to evaluate the various concepts and interpretations of LLD presented in the literature, to determine the current use and application of these concepts in practice in Technical Specifications for operating nuclear plants, and to develop a NUREG document defining and elaborating the NRC position relative to LLD's. The specific work requirements for this agreement may be found in the enclosed Statement of Work.

Article III - ESTIMATE OF COST

The estimated cost of the effort described in the enclosed Statement of Work is $90,000.00.

Article IV - OBLIGATION OF FUNDS

Funds in the amount of $30,000.00 are obligated hereunder and chargeable to the following appropriation data:

B&R Number	Appropriation Symbol	FIN No.
20-19-10-12-3	31X0200.202	B8615

Additional obligations to cover the remainder of costs will be provided through unilateral modification to this agreement, subject to the availability of funds, until such obligations equal the estimated cost in III. above.

Article V - BILLING INSTRUCTIONS

In order for the NBS to receive an advance payment in the amount of $30,000.00, the NBS should forward a completed Standard Form 1081 in an original and three copies upon execution of this agreement to the following address: U.S. Nuclear Regulatory Commission, Office of Resource Management, Washington, DC 20555. Upon final execution of the unilateral modification which provides additional funding, the NBS should forward another completed Standard Form 1081 to the above referenced address to receive the additional obligation.

Article VI - ADVANCE NOTIFICATION

It is estimated that the total cost to the NRC for performance of this contract will not exceed the estimated cost as stated in Article III. NBS agrees to use its best efforts to perform the work specified in the Statement of Work

within such estimated costs. If, at any time, the NBS has reason to believe that the costs which they expect to incur within the succeeding 60 days will exceed 75 percent of the estimated cost when added to all previously incurred costs, the NBS shall notify the Contracting Officer in writing. This notification shall include the revised estimate for the total cost for performance of this interagency agreement.

Article VII - REPORTING REQUIREMENTS

The reporting requirements are contained in the enclosed Statement of Work.

Article VIII - NRC CONTACTS

A. Technical Contact - The NRC technical contact is Wayne Meinke, Division of Systems Integration, Office of Nuclear Reactor Regulation, telephone number (301) 492-9430.

The Project Officer is responsible for: (1) monitoring the technical progress, including the surveillance and assessment of performance and recommending to the Contracting Officer changes in requirements; (2) interpreting the statement of work; (3) performing technical evaluation as required; (4) performing technical inspections and acceptances required by this interagency agreement, and (5) assisting NBS in the resolution of technical problems encountered during performance. The Contracting Officer is responsible for directing or negotiating any changes in terms, conditions, or amounts cited in the agreement.

For guidance from the Project Officer to NBS to be valid, it must: (1) be consistent with the description of work set forth in this agreement; (2) not constitute new assignment of work or change to the expressed terms, conditions, or specifications incorporated into this agreement; (3) not constitute a basis for an extension to the period of performance or agreement delivery schedule; (4) not constitute a basis for any increase in the estimated cost.

ALL TECHNICAL DIRECTIONS SHALL BE ISSUED IN WRITING BY THE PROJECT OFFICER OR SHALL BE CONFIRMED BY HIM/HER IN WRITING WITHIN TEN (10) WORKING DAYS AFTER VERBAL ISSUANCE. A copy of said written direction shall be provided to the Contracting Officer.

In the event the Project Officer desires a change to the interagency agreement within one or more of the categories as defined in (1) through (4) above, he/she must direct such requests to the Contracting Officer. The Contracting Officer will handle the request in accordance with applicable laws and regulations.

B. Contractual Contact

The NRC contractual contact is Ellyce B. Miles, Technical Assistance Contracts Branch, Division of Contracts, Office of Administration, telephone number (301) 492-4294.

If this agreement is acceptable to the National Bureau of Standards, please so indicate by having the authorized personnel sign in the space provided below and return four copies to the undersigned. The fifth copy is for your retention. A fully executed copy will be forwarded to you.

Sincerely,

M J Mattia

Mary Jo Mattia, Chief
Technical Assistance Contracts Branch
Division of Contracts
Office of Administration

Enclosure: Statement of Work

ACCEPTED:

NATIONAL BUREAU OF STANDARDS

BY: John W. Wrenn

TITLE: for David B. Shreve, Comptroller

DATE: 8-18-82

ACCEPTED:

U.S. NUCLEAR REGULATORY COMMISSION

BY: M J Mattia

TITLE: Chief TACB

DATE: 8/30/82

ENCLOSURE

STATEMENT OF WORK

Work Requirements

The literature abounds in diverse terms such as "LLD", "MDC", and "DL", that are used in defining the detection capability of a measurement system or process. Different governmental agencies use different terminologies, and different approaches to the question are often used by the theoretician, by the researcher, or by the practicing analyst who requires an answer that will stand up to regulator scrutiny (e.g., "was contamination present?")

The term LLD for "lower limit of detection" is used in three specific places in the NRC Standard Radiological Effluent Technical Specifications (RETS) --- NUREG-0472 and NUREG-0473: for liquid radwaste sampling on page 3/4 11-2; for gaseous radwaste sampling on page 3/4 11-9; and for radiological environmental monitoring on page 3/4 12-10. The term is also used in the Radiological Assessment Branch Technical Position (BTP) for radiological environmental monitoring.

At present NRC relies on documentation on LLDs that has been developed by other agencies for their own purposes. Reference is made in the RETS to three documents that provide general information on LLDs, but these documents do not provide specif guidance for the many problems involving detection capabilities in both effluent and environmental measurements that are encountered in the RETS.

The focus of the contract will be the development of criteria to establish and clarify the NRC position relative to the specification of detection capability for radiological measurements, and the support and publication of this position through examples and discussion of the determination of LLDs under the various "hands-on" conditions encountered in carrying out the radiological effluent and environmental monitoring programs specified in the RETS.

A thorough search of the literature should be made to identify various means used both today and during the past two decades to define the detection capability (particularly of sensitivity) of a measurement system or process, as well as of a particular measurement. Various "schools" of thought, as well as diverse proposals (both by individuals and organizations), as to specific approaches to this problem should be identified, and a short summary of the thrust of the major positions should be made. (For example, if as a recent Health Physics Society Committee Report maintains, the LLD is not intended to be an "a posteriori" criterion for the presence or absence of contaminating activity in a sample, how does one determine the presence or absence of activity in that sample.)

Difficulties encountered in implementing LLD concepts by NRC licensees and Operating Licenses (OL) applicants should be identified. These difficulties should be discussed with a number of licensees and licensee contractors at their facilities and/or by telephone to determine the difficulties in this area that they are experiencing with the present RETS and NRC guidance, and their ideas as to ways to improve the situation.

Discussions should then be held with NRC staff to develop the NRC position, either confirming the present RETS statements and position, or modifying them to better serve their stated purpose.

This NRC position on detection limits shoul then be developed in detail in a self-sufficient manual -- providing extensive supporting information and guidance so that licensees can readily apply these concepts to their RETS and the reports required by the RETS. Additional sections or Appendices should contain a number of examples illustrating various problems and methods of calculating and using the LLDs for the types of radionuclide analyses specified in the RETS.

The resulting NUREG document would provide complete guidance to a licensee for undertaking and carrying out the LLD requirements of the RETS and of the periodic reports on Radiological Effluent Releases and Radiological Environmental Monitoring required by the RETS. It would further provide definitive guidance in answering the regulatory questions: "Is contamination present in an environmental or effluent sample or system? How much is present? and With what certainty can these statements be made?"

Task 1

The Agency shall perform a thorough literature search to identify various means used today and during the past two decades to define the detection capability of a measurement system or process. Within four (4) months after award, the Agency shall prepare an informal 1 - 3 page summary/outline of this search and meet with the NRC staff to discuss the relevance of the literature to NRC RETS problems.

4 months

After project start date

Task 2

The Agency shall make one (1) visit to each of 2 - 3 nuclear power plants as designated by the NRC PO that are either operating (OR) or are in the final stages of licensing (OL). Additionally the Agency shall visit 1 - 2 environmental analysis contractors to nuclear utilities. During these visits, the Agency shall discuss questions and difficulties in the area of LLDs for effluent and environmental measurements that plant personnel are experiencing with the present RETS and NRC guidance, and their ideas as to ways to improve the situation. Within eight (8) months after award, the Agency shall prepare an informal 1 - 3 page summary/outline of these visits and meet with the NRC staff to discuss licensee comments obtained in these visits and by telephone.

8 months

After project start date

Task 3

Based upon the findings of Tasks 1 and 2 and discussions with NRC staff, the Agency shall establish, develop, and clarify the NRC position relative to the specification of detection capability for radiological effluent and environmental measurements to be used in the RETS and in other NRC guidance. Within 12 months of award date, the Agency shall document this position in a one-page statement that will be used as the foundation for the final report/manual. Additionally, the Agency shall prepare a firm outline of the final report/manual and discuss the outline with NRC staff.

12 months or earlier

After project start date

Task 4

Within 18 months of award, the Agency shall prepare a detailed report/manual with references that will provide complete guidance to NRC licensees for undertaking and carrying out the LLD requirements of the RETS and of the periodic reports on Radiological Environmental Monitoring required by the RETS.

18 months or earlier

After project start date

Level of Effort and Period of Performance

The level of effort is estimated at about 1 1/4 person-years over a performance period of 18 months.

Reports Required

During the performance of the agreement, the Agency shall be required to submit the following reports:

1. Upon completion of Task 1, a short, informal 1-3 page summary/outline of the literature search to serve as a focal point for discussion with the NRC staff.

2. Upon completion of Task 2, a short, informal 1-3 page summary/outline of the visits to, and telephone conversations with, utilities/contractors to serve as a focal point for discussion with the NRC staff.

3. Upon completion of Task 3, a one-page statement of the NRC position relative to LLD that had been agreed upon by both NBS and NRC. Also a firm outline of the final report to be discussed with, and agreed upon by, the NRC staff.

4. A final report/manual to be issued as a NUREG document will be due upon completion of Task 4.

The report should include but not be limited to:

a) A statement of the NRC position relative to LLD for radioactivity measurements.

b) Sections of perspective of the questions and problems in defining detection capability developed through the literature search and through visits to, and telephone conversations with, power plant and utility contractor laboratories.

c) Extensive supporting information and guidance on the calculation and use of LLD so that licensees can readily apply these concepts to their RETS and to the reports required by the RETS.

d) Sections or Appendices that contain a number of examples illustrating various problems and methods of calculating and using LLDs for the types of radionuclides specified in the RETS.

Within six (6) weeks of completion of the project, the Agency shall submit four copies of the draft final report to the Project Officer for staff review and approva Within thirty days of receipt of the staff's comments on the draft report, the Agency shall submit to the Project Officer one (1) camera-ready copy of the fina report for use by NRC in publication of the report as a NUREG document.

Business Letter Report

5. A monthly business letter report shall be submitted by the 15th of the month to the Project Officer with copies provided to the Director, Division of Systems Integration, ATTN: S. Boyd, W. Houston, DSI, Mr. B. L. Grenier, NRR, and the Contracting Officer. These reports will identify the title of the project, the FIN, the Principal Investigator, the period of performance, and the reporting period and will contain two (2) sections as follows:

Project Status Section

1. A listing of the efforts completed during the period; milestones reached, or if missed, an explanation provided.

2. Any problems or delays encountered or anticipated and recommendations for resolution.1/

3. A summary of progress to date (this may be expressed in terms of percentage completion for the project).

4. Plans for the next reporting period.

Financial Status Section

1. Provide the total cost (value) of the project as reflected in the proposal and the total amount of funds obligated to date.

2. Provide the total amount of funds expended (costed) during the period and the balance to date.

1/ If the recommended resolution involves a contract modification, i.e., change in work requirements, level of effort (costs), or period of performance, a separate letter should be prepared and submitted to the Director, Division of Systems Integration, ATTN: S. Boyd, W. Houston, DSI, and a copy provided to the Project Manager and B. L. Grenier, NRR.

2/ Provide percentage against total funds obligated to date.

Meetings and Travel

Trips to 2-3 nuclear power plants(and 1-2 contractor laboratories) that are either operating or are in the final stages of licensing should be planned and budgeted. These plants should be representative of plants that have shown considerable concern with the LLD portions of their RETS. Selection of the plants and laboratories, and the dates for these trips will be mutually agreed upon between the Project Manager and the Principal Investigator.

NRC Furnished Material

Upon award of the agreement, the Agency will be provided with various documents pertinent to this effort. All documents provided may be retained by the Agency.

Key Personnel

It is required that Dr. Lloyd A. Currie be the principal investigator performing this work.

Meetings and Travel

The Agency shall be required to attend the following meetings/visits:

1. It is estimated that three (3) meetings will be held at the NRC Bethesda offices to discuss technical aspects of the project.

2. One (1) day site visit to each of 2 - 3 nuclear power plants and one (1) day site visit to each of 1 - 2 environmental analysis contractors as designated during the performance of Task 2.