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

JUL 16 1984

Note to Will Brown

SUBJECT: PROPOSED STATEMENT OF WORK
(FIN NO: B0294)

It appears that the enclosed statement of work may be more expansive than needed to meet our needs. Before approving it, I would like to know what information NRC already has which might be duplicated in this statement of work. For example, are Final Safety Analysis Reports prepared by class 104 licensees? If so, do they contain accident analyses covering improper manipulation controls, etc?

write to NRR & this with this

R.F. Burnett

Enclosure:
Statement of Work

Part 20 versus Part 100
assume anything fails

B/3

STATEMENT OF WORK

CONSEQUENCES OF SABOTAGE AT NONPOWER REACTORS

(FIN NO: B0294)

(B&R NO: 50-19-02-00)

1.0 Background

In 1979, Los Alamos Scientific Laboratory conducted a study on the consequences of sabotage at nonpower reactors. It was concluded that, within the constraints of this study, only one nonpower reactor had any potential for the release of significant amounts of fission product materials in the event of sabotage. Because of terrorist activities in other parts of the world, as well as concerns by the ACRS about manipulation of reactor control systems and concerns by a public interest group about the effects of incendiary devices on reactor components, staff believes that it would be prudent to supplement this study with further technical information to assure that the margin of safety provided to the public is maintained.

2.0 Work Required

Los Alamos National Laboratory shall determine and evaluate the risks and potential consequences of both a loss of coolant incident and the direct fuel damage which would be produced by: (a) blast effects from various quantities and types of explosives, (b) the production of heat from incendiary devices, and (c) the unauthorized manipulation of reactor controls and fuels at nonpower (NPRs) operating at 20 MW, 10 MW, 5 MW and 2 MW; and on a generic basis (to the extent possible) at NPRs operating below 2 MW. Specifically designed mathematical models or other appropriate methods shall be used to determine the quantities of explosives and incendiary materials required to cause the maximum consequence events. Assessments of the maximum case incidents shall include the consequences associated with core meltdown, partial core meltdown, and disintegration and/or crushing of the core.

Facilities shall be grouped by common design feature and analysis of a representative from each group shall be performed in the sequence of descending power.

License	Docket No.	Power Level	Reactor Type
National Bureau of Standards	50-184	20 MW	Tank
University of Missouri	50-186	10 MW	Tank
Georgia Institute of Technology	50-160	5 MW	Tank
Massachusetts Institute of Technology	50-20	5 MW	Tank
Union Carbide	50-54	5 MW	Pool
Rhode Island Atomic Energy Commission	50-193	2 MW	Pool
State University of New York	50-57	2 MW	Pool
University of Michigan	50-2	2 MW	Pool
University of Virginia	50-62	2 MW	Pool
General Atomic Technologies, Inc.	50-163	1.5 MW	Pool
North Carolina State University	50-297	1 MW	Pool
Oregon State University	50-243	1 MW	Pool
Texas A&M	50-128	1 MW	Pool
University of Lowell	50-223	1 MW	Pool

Los Alamos National Laboratory shall perform the following tasks:

2.1 Task No. 1

A review of existing information in available sources such as the NRC docket files augmented by site-specific information provided by NRC staff and on site inspection visits shall be conducted to: (a) familiarize task personnel with characteristics peculiar to each reactor, and (b) obtain information necessary to aid in the calculation of the radiological consequences for each of the NPRs listed above, as appropriate.

2.2 Task No. 2

Mathematical models and/or other appropriate methods shall be developed and used to:

a. calculate the worst case radiological release as a result of total core meltdown, partial core meltdown core, disintegration and/or crushing, or other means which could severely damage the fuel in the reactor core. Since the key consideration is the fission product release associated with such incidents, the effects of using low enriched uranium versus high enriched uranium on the fission product release shall be evaluated,

b. determine, as a function of distance from the reactor, the total on-site and off-site radiation dose (rem) to the whole body and the radiation dose (rem) to the thyroid from iodine exposure, and

c. identify any facility from which a fission product release could exceed a 10 CFR, Part 100 release and determine the characteristics of the event that would limit it to less than a Part 100 release.

Certain other parameters and assumptions should be considered when performing this task. These include, but are not limited to the following:

a. The models or methods used to calculate the damage and the releases should assume that the reactor has been operating at the maximum power level authorized by NRC license and that equilibrium of fission products was attained prior to the incident. Note: If the worst case damage to the core or subsequent release is calculated to occur after a period of reactor shutdown, this should also be evaluated,

b. In those cases in which the fission product inventory of the NPR is determined to be insufficient to create a risk to the public health and safety, or those in which the fuel configuration or composition, and/or the reactor construction or other factors is such as to limit the fuel damage and fission product release to a level that is insufficient to create a risk to the public health and safety, the study for that facility shall be terminated, and the basis for the conclusion documented,

c. No assumptions are made regarding the saboteurs' capabilities nor is there any design basis threat associated with this task,

d. For baseline considerations, it should be assumed that all reactor safety features fail upon initiation of the incident,

e. The mean meteorological conditions at the site and the surrounding area should be considered when calculating the atmospheric dispersion of a release, and

f. Where there is an uncertainty in the calculations of the fission product release the results reported should be reasonably conservative.

2.3 Task No. 3

After Tasks No. 1 and 2 have been accomplished, mathematical models or other appropriate methods shall be developed to calculate the amount of explosives and the amount of incendiary material needed to cause the maximum and the limiting events described in Task No. 2 above. Calculations shall be made for the placement of explosives and incendiary devices at the reactor facility boundary and attached to reactor components.

Certain parameters and assumptions should be considered in those calculations. These include, but are not limited to the following:

a. The type of explosives and incendiary devices used to cause an event are assumed to be easily obtainable.

b. Two opposing conditions shall be considered in performing Task 3:

   i. Safeguards credit shall be given for all physical barriers interposed between the explosives/incendiaries and the reactor fuel, and

   ii. The adversary shall have access to all reactor components in carrying out the sabotage event.

c. Where there is an uncertainty in the calculations of the damage associated with the explosives and incendiary devices; the results reported should be conservative.

2.4 Task No. 4

Upon completion of Task No. 3, for those cases in which the offsite fission product release exceeds a Part 100 release, calculate the amount of explosives and the amount of incendiary material needed to cause the release at the facility boundary of a Part 100 release. These calculations shall also be made for the placement of explosives and incendiary devices at the reactor facility boundary and attached to reactor components.

The parameters and assumptions employed in Task No. 3 shall be utilized in this task.

2.4 Task No. 5

Upon completion of Task No. 3, a review and evaluation of reactor control systems and fuels shall be made to determine whether an unauthorized manipulation of such controls could cause any detrimental effects that may be identified in Task No. 2.

2.5 Task No. 6

Upon completion of Task No. 3, calculate the mitigating effects of full and partial operation of existing safety features associated with the operation of the reactor (these features are ignored under Task 3 to determine maximum consequences). Identify additional safety measures and modifications as well as administrative procedures and practices which could be adopted and determine the degree to which these additional considerations would mitigate the consequences. Exclude specific safeguards measures from consideration in this task.

3.0 Reporting Requirements

3.1 Monthly Letter Status Report

A monthly report shall be given which summarizes the progress of the tasks being performed including:

- o The work performed during the previous month.
- o Personnel time expenditures during the previous month.
- o Problems encountered and the proposed solutions.
- o Activities planned for the ensuing two months.
- o Costs generated against the work effort during the previous month (including direct salaries, materials and services, ADP support, subcontracts, travel, general or other related items).
- o Current obligation status information

The first monthly report shall provide the initial projections or indicate "no change in the cost and uncosted obligation projection." The report shall be due by the 15th of each month with distribution as follows:

Donald M. Carlson, SG, NMSS - one copy
Office of the Director, NMSS (ATTN: Program Support) - one copy

3.2 Interim Reports

A draft interim report shall be furnished to the NMSS Project Manager upon completion of each major task (i.e., Tasks Nos. 2, 3, 4 and 5). After review by appropriate NRC personnel, the Project Manager will provide comments on the draft report to Los Alamos National Laboratory within sixty (60) days of receipt of each report.

3.3 Final Reports

Los Alamos National Laboratory shall furnish two copies of draft final reports to the NMSS Project Manager (PM) and one copy to the Office of the Director, NMSS (ATTN: Program Support) by June 30, 1986. The documents shall be published as NUREG/CR series reports and will provide:

a. The on-site and off-site dosage calculations associated with a total loss of coolant,

b. The quantities of explosives and incendiary material or description of acts necessary to cause a limiting case incident,

c. The placement of explosives and incendiary materials in relation to the reactor,

d. The resulting consequences, and

e. Appropriate alternative measures which can be implemented to mitigate a significant event (e.g., reactor facility modifications, administrative procedures, etc.).

After review by appropriate NRC personnel, the PM will provide comments on the draft reports to Los Alamos National Laboratory by August 15, 1986.

The performing organization shall revise the draft reports based on the PM's comments and submit the reproducible master of each final report to the PM within four weeks after receipt of comments from the PM.

All draft reports, as well as final reports, shall be screened for Classified Information and appropriately marked in accordance with "NRC Classification Guide for Information Dealing with the Release and Dispersion of Radioactive Material (NRC-RDRM-1)," dated September 1982.

3.4 Program Plan

Within one month after initiation of task orders, LANL shall provide a detailed work plan which identifies study milestones and their projected date of accomplishment. Upon NRC review and approval of this plan, it will then become the operating schedule for the overall task.

4.0 Meetings

LANL representative(s) shall meet with the NMSS Project Manager two to four times a year. Upon completion of the draft final report, LANL representatives, upon request of the PM, shall brief NMSS staff in Washington, DC.

All travel, other than that to NRC licensees in order to accomplish a given task, requires approval of the NRC Project Manager.

5.0 NRC Furnished Material

None, except information in available sources such as NRC docket files.

6.0 Level of Effort

It is expected that approximately three and one half staff years of technical support will be required to satisfy the provisions of the Statement of Work.

7.0 Period of Performance

Performance for tne overall task shall commence on the effective date of this agreement and continue through September 30, 1986.

8.0 Quality Assurance

For all draft and final technical reports delivered under this contract, the contractor shall assure that an independent review and verification of all numerical computations and mathematical equations and deviations are performed by qualified contractor personnel other than the original author(s) of the reports. If the contractor proposes to verify/check less than 100 percent of all computations and mathematical equations and derivations in the report(s), (such as might be the case when there are a large number of routine, repetitive calculations), the contractor must first obtain written approval from the NMSS Project Manager.

Computer-generated calculations will not require verification where the computer program has already been verified.

In addition, for all reports, including those which do not contain numerical analyses, a management review shall be conducted prior to submission to the NRC.

9.0 Technical Direction

Mr. Donald M. Carlson (FTS 427-4712) is designated the NMSS Project Manager for the purpose of assuring that the services required under this Statement of Work are delivered in accordance herewith. All technical instructions to the performing organization shall be issued through the NMSS PM. As used herein, technical instructions are those which provide details, suggest possible lines of inquiry, or otherwise complete the general scope of work set forth herein. Technical instructions shall not constitute new assignments or work or changes of such nature as to justify an adjustment in cost or peiod of performance. Directions for changes in cost or period of performance will be provided after receipt of an appropriate Standard Order for Work (SOW) (NRC Form 173) frum the Director of the Office of Nuclear Material Safety and Safeguards (NMSS).