

2. CONTRACT (Proc. Inst. Ident.) NO. NRC-04-89-099 3. EFFECTIVE DATE September 30, 1989 4. REQUISITION/PURCHASE REQUEST PROJECT NO. SBIR-89-063

5. ISSUED BY U.S. Nuclear Regulatory Commission Division of Contracts and Property Management Washington, DC 20555 CODE 6. ADMINISTERED BY (If other than Item 5) CODE

7. NAME AND ADDRESS OF CONTRACTOR (No. street, city, county, State and ZIP Code) Gamma Engineering P.O. BOX 7805 #202 GAITHERSBURG, MD 20898-7805 8. DELIVERY FOB ORIGIN OTHER (See below)

9. DISCOUNT FOR PROMPT PAYMENT NA 10. SUBMIT INVOICES (If copies unless otherwise specified) TO THE ADDRESS SHOWN IN G.3

11. SHIP TO/MARK FOR U.S. Nuclear Regulatory Commission Attn: Frank Costanzi, RES, NLN-344 Washington, DC 20555 CODE FACILITY CODE 12. PAYMENT WILL BE MADE BY U.S. Nuclear Regulatory Commission DAF/Gov/Comm Accts Section, MNBB-11104 Washington, DC 20555 CODE

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION 10 U.S.C. 2304(c)(1) 41 U.S.C. 253(c)(1) 5 14. ACCOUNTING AND APPROPRIATION DATA B&R: 96-01-95-00-40 FIN: L1280-9 Appn: 31X0200.905 Obligated: \$49,384.00

15A. ITEM NO. 15B. SUPPLIES/SERVICES 15C. QUANTITY 15D. UNIT 15E. UNIT PRICE 15F. AMOUNT

The contractor shall perform research entitled "Feasibility Study on Use of Ceramic Fuel Cladding to Reduce the Severity of LWR Accidents" in accordance with the schedule and the contractor's technical proposal dated March 24, 1989, which is incorporated herein and made a part hereof.

This is a firm-fixed-price contract.

8910160084 890929 PDR CONTR NRC-04-89-099 PDC

15G. TOTAL AMOUNT OF CONTRACT \$49,384.00

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CONTRACTING OFFICER WILL COMPLETE ITEM 17 OR 18 AS APPLICABLE

17. CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return 3 copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.) 18. AWARD (Contractor is not required to sign this document.) Your offer on Solicitation Number including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as in the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award/contract. No further contractual document is necessary.

19A. NAME AND TITLE OF SIGNER (Type or print) HERBERT FEINROTH, President 20A. NAME OF CONTRACTING OFFICER Elois J. Wiggins

19B. NAME OF CONTRACTOR BY Herbert Feinroth (Signature of person authorized to sign) 19C. DATE SIGNED 9/24/89 20B. UNITED STATES OF AMERICA BY Elois J. Wiggins (Signature of Contracting Officer) 20C. DATE SIGNED 9/27/89

Section B - Supplies or Services and Prices/Costs

B.1 Brief Description of Work

The contractor shall conduct research entitled "Feasibility Study on Use of Ceramic Fuel Cladding to Reduce the Severity of LWR Accidents."

B.2 Total Fixed Price.....\$49,384.00

Section C - Description/Specifications/Work Statement

C.1 Statement of Work

The work to be performed and the objectives to be met in this contract shall be in accordance with the contractor's technical proposal in response to the FY 1989 Small Business Innovation Research Program (SBIR) which is incorporated herein as Attachment 4.

Section D - Packaging and Marking

D.1 The Contractor shall package material for shipment to the NRC in such a manner that will ensure acceptance by common carrier and safe delivery at destination. Containers and closure shall comply with the Interstate Commerce Commission Regulations, Uniform Freight Classification Rules, or regulations of other carriers as applicable to the mode of transportation. On the front of the package, the Contractor shall clearly identify the contract number under which the product is being provided.

Section E - Inspection and Acceptance

E.1 FAR Citations

The contractor shall refer to Section I, Clause No. 52.252-2 for citations incorporated by reference.

Section F - Deliveries and Performance

F.1 Reports, Documentation and Other Deliverable End Items

- a. Letter progress reports in three copies to the Project Officer and one copy to the Contracting Officer shall be due by November 30, 1989, and January 30, 1990.
- b. A final report to include the results of the work performed under this contract shall be submitted to the Project Officer in one camera-ready copy and three copies on March 30, 1990. In addition, one copy of the final report shall be submitted to the Contracting Officer on March 30, 1990.

F.2 Place of Delivery

The items to be furnished hereunder shall be delivered, with all transportation charges paid by the Contractor, to:

1. Copies to Project Officer:

U.S. Nuclear Regulatory Commission
ATTN: Frank Costanzi
Office of Nuclear Regulatory Research
Division of Engineering Technology
Mail Stop: NLN-344
Washington, DC 20555

2. Copies to Contracting Officer:

U.S. Nuclear Regulatory Commission
ATTN: Contracting Officer
Division of Contracts and Property Management
Contract Administration Branch, P-902
Washington, DC 20555

F.3 Duration of Contract Period

This contract shall become effective on September 30, 1989, as specified in Block 3 of the SF-26, and shall continue to completion thereof, on March 30, 1990.

F.4 FAR Citations

The contractor shall refer to Section I, Clause No. 52.252-2 for citations incorporated by reference.

Section G - Contract Administration Data

G.1 Technical Direction

- A. Performance of the work under this contract shall be subject to the technical direction of the NRC Project Officer named in Section G.2 of this contract. The term "Technical Direction" is defined to include the following:
1. Technical direction to the Contractor which shifts work emphasis between areas of work or tasks, requires pursuit of certain lines of inquiry, fills in details, or otherwise serves to accomplish the contractual scope of work.
 2. Providing assistance to the Contractor in the preparation of drawings, specifications or technical portions of the work description.

3. Review and, where required by the contract, approval of technical reports, drawings, specifications and technical information to be delivered by the Contractor to the Government under the contract.
- B. Technical direction must be within the general scope of work stated in the contract. The Project Officer does not have the authority to and may not issue any technical direction which:
1. Constitutes an assignment of additional work outside the general scope of the contract.
 2. Constitutes a change as defined in the clause of the General Provisions, entitled "Changes."
 3. In any way causes an increase or decrease in the total price, or the time required for contract performance.
 4. Changes any of the expressed terms, conditions or specifications of the contract.
- C. ALL TECHNICAL DIRECTIONS SHALL BE ISSUED IN WRITING BY THE PROJECT OFFICER OR SHALL BE CONFIRMED BY SUCH PERSON IN WRITING WITHIN TEN (10) WORKING DAYS AFTER VERBAL ISSUANCE. A copy of said written direction shall be submitted to the Contracting Officer.

The Contractor shall proceed promptly with the performance of technical directions duly issued by the Project Officer in the manner prescribed by this article and within such person's authority under the provisions of this article.

If, in the opinion of the Contractor, any instruction or direction issued by the Project Officer is within one of the categories as defined in B(1) through (4) above, the Contractor shall not proceed but shall notify the Contracting Officer in writing within five (5) working days after the receipt of any such instruction or direction and shall request the Contracting Officer to modify the contract accordingly. Upon receiving such notification from the Contractor, the Contracting Officer shall issue an appropriate contract modification or advise the Contractor in writing that, in the Contracting Officer's opinion, the technical direction is within the scope of this article and does not constitute a change under the Changes Clause.

- D. Any unauthorized commitment or direction issued by the Project Officer may result in an unnecessary delay in the Contractor's performance, and may even result in the Contractor expending funds for unallowable costs under the contract.

- E. A failure of the parties to agree upon the nature of the instruction or direction or upon the contract action to be taken with respect thereto shall be subject to the provisions of the contract clause entitled "Disputes."

G.2 Project Officer

- A. The individual(s) listed in "B" below is (are) hereby designated as the Contracting Officer's authorized representative (hereinafter called Project Officer) for technical aspects of this contract. The Project Officer is not authorized to approve or request any action which results in or could result in an increase in contract cost; or terminate, settle any claim or dispute arising under the contract, or issue any unilateral directive whatever.

The Project Officer is responsible for: (1) monitoring the Contractor's technical progress, including surveillance and assessment of performance, and recommending to the Contracting Officer changes in requirements; (2) interpreting the scope of work; (3) performing technical evaluation as required; (4) performing technical inspections and acceptances required by this contract; and (5) assisting the Contractor in the resolution of technical problems encountered during performance. Within the purview of this authority, the Project Officer is authorized to review all costs requested for reimbursement by Contractors and submit recommendations for approval, disapproval, or suspension for supplies/services required under the contract. The Contracting Officer is responsible for directing or negotiating any changes in terms, conditions, or amounts cited in the contract.

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

- B. Name and Phone No.: Frank Costanzi (301) 492-3525
Office Address: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Mail Stop. NLN-344
Washington, DC 20555

G.3 Invoice Requirements

Invoices shall be submitted in an original and 3 copies to:

U.S. Nuclear Regulatory Commission
Division of Contracts and Property Management
Contract Administration Branch - P-902
Washington, D.C. 20555.

To constitute a proper invoice, the invoice must include the following information and/or attached documentation:

1. Name of the business concern and invoice date.
2. Contract number or other authorization for delivery of property or services.
3. Description price and quantity of property and services actually delivered or rendered.
4. Shipping and payment terms.
5. Name (where practicable), title, phone number, and complete mailing address of responsible official to whom payment is to be sent.
6. Other substantiating documentation or information as required by the contract.

G.4 Payment

- a. Payment shall be made in the amount of \$16,000.00 to the contractor after receipt of each of the two letter progress reports as required in Section F.1.a. Payment shall not be made prior to receipt of said progress reports.
- b. Final payment shall be made in the amount of \$17,384.00 to the contractor after receipt of the final report as required in Section F.1.b.
- c. All contractor invoices shall identify the contract number and the monthly letter progress report for which payment is claimed.
- d. If this contract provides for a discount, the contract shall indicate the contract's discount terms (Block 9 of Standard Form 26) on the face page of the invoice.

Section H - Special Contract Requirements

H.1 KEY PERSONNEL (MAR 1987)

a. The following individuals are considered to be essential to the successful performance of the work hereunder.

The Contractor agrees that such personnel shall not be removed from the contract work or replaced without compliance with paragraphs b and c hereof.

b. If one or more of the key personnel for whatever reason becomes, or is expected to become, unavailable for work under this contract for a continuous period exceeding 30 work days, or is expected to devote substantially less effort to the work than indicated in the proposal or initially anticipated, the Contractor shall immediately notify the Contracting Officer and shall, subject to the concurrence of the Contracting Officer, promptly replace such personnel with personnel of at least substantially equal ability and qualifications.

c. All requests for approval of substitutions hereunder must be in writing and provide a detailed explanation of the circumstances necessitating the proposed substitutions. They contain a complete resume for the proposed substitute, and other information requested by the Contracting Officer to approve or disapprove the proposed substitution. The Contracting Officer will evaluate such requests and promptly notify the Contractor of his/her approval or disapproval thereof in writing.

d. If the Contracting Officer determines that:

1) Suitable and timely replacement of key personnel who have been reassigned, terminated or have otherwise become unavailable for the contract work is not reasonably forthcoming; or

2) That the resultant reduction of effort would be so substantial as to impair the successful completion of the contract or the service order, the contract may be terminated by the Contracting Officer for default or for the convenience of the Government, as appropriate. If the Contracting Officer finds the Contractor at fault for the condition, the contract price or fixed fee may be equitably adjusted downward to compensate the Government for any resultant delay, loss or damage.

H.2 Safety, Health, and Fire Protection

The Contractor shall take all reasonable precautions in the performance of the work under this contract to protect the health and safety of employees and of members of the public and to minimize danger from all hazards to life and property and shall comply with all health,

safety, and fire protection regulations and requirements (including reporting requirements) of the Commission and the Department of Labor. In the event that the Contractor fails to comply with said regulations or requirements, the Contracting Officer may, without prejudice to any other legal or contractual rights of the Commission, issue an order stopping all or any part of the work, thereafter, a start order for resumption of work may be issued at the discretion of the Contracting Officer. The Contractor shall make no claim for an extension of time or for compensation or damages by reason of or in connection with such work stoppage.

H.3 Dissemination of Contract Information (OMB Clearance Number 3150-0112)

The Contractor shall not publish, permit to be published, or disseminate to the public any information, oral or written, concerning the work performed under this contract without the prior written consent of the Contracting Officer. Two copies of any information proposed to be published or disseminated shall be submitted to the Contracting Officer. Failure to comply with this clause shall be grounds for termination of this contract.

H.4 Private Use of Contract Information and Data (June 1988)

Except as specifically authorized by this contract, or as otherwise approved by the Contracting Officer, information and other data developed or acquired by or furnished to the Contractor in the performance of this contract shall be used only in connection with the work under this contract.

H.5 Drawings, Designs, and Specifications

All drawings, sketches, designs, design data, specifications, notebooks, technical and scientific data, and all photographs, negatives, reports, findings, recommendations, data and memoranda of every description relating thereto, as well as all copies of the foregoing relating to the work or any part thereto, shall be subject to inspection by the Commission at all reasonable times (for which inspection the proper facilities shall be afforded the Commission by the Contractor and its subcontractors), shall be the property of the Government and may be used by the Government for any purpose whatsoever without any claim on the part of the Contractor and its subcontractors and vendors for additional compensation and shall, subject to the right of the Contractor to retain a copy of said material for its own use, be delivered to the Government, or otherwise disposed of by the Contractor either as the Contracting Officer may from time to time direct during the progress of the work or in any event as the Contracting Officer shall direct upon completion or termination of this contract. The Contractor's right of retention and use shall be subject to the security, patent, and use of information provisions, if any, of this contract.

H.6 Proprietary Data and Confidential Information

In connection with the performance of the work under this contract, the Contractor may be furnished, or may develop or acquire, proprietary data (trade secrets) or confidential or privileged technical, business, or financial information, including Commission plans, policies, reports, financial plans, internal data protected by the Privacy Act of 1974 (P.L. 93-579), or other information which has not been released to the public or has been determined by the Commission to be otherwise exempt from disclosure to the public. The Contractor agrees to hold such information in confidence and not to directly or indirectly duplicate, disseminate, or disclose such information, in whole or in part, to any other person or organization except as may be necessary to perform the work under this contract. The Contractor agrees to return such information to the Commission or otherwise dispose of it, either as the Contracting Officer may, from time to time, direct during the progress of the work or, in any event, as the Contracting Officer shall direct upon completion of termination of this contract. Failure to comply with this clause shall be grounds for termination of this contract.

H.7 Organizational Conflicts of Interest (OMB Clearance Number 3150-0112) (JUNE 1988)

a. Purpose. The primary purpose of this clause is to aid in ensuring that the Contractor:

1) Is not placed in a conflicting role because of current or planned interests (financial, contractual, organizational, or otherwise) which relate to the work under this contract, and

2) Does not obtain an unfair competitive advantage over other parties by virtue of its performance of this contract.

b. Scope. The restrictions described apply to performance or participation by the Contractor as defined in 41 CFR 20-1.5402(f) in the activities covered by this clause.

c. Work for others. Notwithstanding any other provision of this contract, during the term of this contract, the Contractor agrees to forgo entering into consulting or other contractual arrangements with any firm or organization the result of which may give rise to a conflict of interest with respect to the Work being performed under this contract the Contractor shall ensure that all employees under this contract abide by the provision of this clause. If the Contractor believes with respect to itself or any employee that any proposed consultant or other contractual arrangement with any firm or organization may involve a potential conflict of interest, the Contractor shall obtain the written approval of the Contracting Officer prior to execution of such contractual arrangement.

d. Disclosure after award

1) The Contractor warrants to the best of its knowledge and belief and except as otherwise set forth in this contract, that it does not have any organizational conflicts of interest as defined in 41 CFR 20-1.5402(d).

2) The Contractor agrees that, if after award, it discovers organizational conflicts of interest with respect to this contract, it shall make an immediate and full disclosure in writing to the Contracting Officer. This statement must include a description of the action which the Contractor has taken or proposes to take to avoid or mitigate such conflicts. The NRC may, however, terminate the contract if termination is in the best interest of the Government.

e. Access to and use of information.

1) If the Contractor in the performance of this contract obtains access to information, such as NRC plans, policies, reports, studies, financial plans, internal data protected by the Privacy Act of 1974 (Pub. L. 93-579), or data which has not been released to the public, the Contractor agrees not to:

(i) Use this information for any private purpose until the information has been released to the public;

(ii) Compete for work for the Commission based on the information for a period of six (6) months after either the completion of this contract or the release of the information to the Public, whichever is first;

(iii) Submit an unsolicited proposal to the Government based on the information until one year after the release of the information to the public, or

(iv) Release the information without prior written approval by the Contracting Officer unless the information has previously been released to the public by the NRC.

2) In addition, the Contractor agrees that to the extent it receives or is given access to proprietary data, data protected by the Privacy Act of 1974 (Pub. L. 93-579), or other confidential or privileged technical, business, or financial information under this contract, the Contractor shall treat the information in accordance with restrictions placed on use of the information.

3) The Contractor shall have, subject to patent and security provisions of this contract, the right to use technical data it produces under this contract for private purposes provided that all requirements of this contract have been met.

f. Subcontracts. Except as provided in 41 CFR 20-1.5402(h), the Contractor shall include this clause including this paragraph, in subcontracts of any tier. The terms contract, "Contractor," and "Contracting Officer," must be appropriately modified to preserve the Government's rights.

g. Remedies. For breach of any of the above restrictions or for intentional nondisclosure or misrepresentation of any relevant interest required to be disclosed concerning this contract or for such erroneous representations that necessarily imply bad faith, the Government may terminate the contract for default, disqualify the Contractor from subsequent contractual efforts, and pursue other remedies Permitted by law or this contract.

h. Waiver. A request for waiver under this clause must be directed in writing through the Contracting Officer to the Executive Director for Operations (EDO) in accordance with the procedures outlined in 41 CFR 20-1.5411.

H.8 Government Furnished Equipment/Property - None Provided (June 1988)

The Government will not provide any equipment/property under this contract.

PART II - CONTRACT CLAUSES

SECTION I - CONTRACT CLAUSES

I.1 NOTICE LISTING CONTRACT CLAUSES INCORPORATED BY REFERENCE

NOTICE: The following solicitation provisions and/or contract clauses pertinent to this section are hereby incorporated by reference:

FEDERAL ACQUISITION REGULATION (48 CFR CHAPTER 1)

NUMBER	DATE	TITLE
52.202-1	APR 1984	DEFINITIONS
52.203-1	APR 1984	OFFICIALS NOT TO BENEFIT
52.203-3	APR 1984	GRATUITIES
52.203-5	APR 1984	COVENANT AGAINST CONTINGENT FEES
52.203-6	JUL 1985	RESTRICTIONS ON SUBCONTRACTOR SALES TO THE GOVERNMENT
52.203-7	OCT 1988	ANTI-KICKBACK PROCEDURES
52.215-1	APR 1984	EXAMINATION OF RECORDS BY COMPTROLLER GENERAL
52.215-2	APR 1988	AUDIT -- NEGOTIATION
52.215-31	SEP 1987	WAIVER OF FACILITIES CAPITAL COST OF MONEY
52.215-33	JAN 1986	ORDER OF PRECEDENCE
52.219-8	JUN 1985	UTILIZATION OF SMALL BUSINESS CONCERNS AND SMALL DISADVANTAGED BUSINESS CONCERNS
52.219-13	AUG 1986	UTILIZATION OF WOMEN-OWNED SMALL BUSINESSES
52.220-3	APR 1984	UTILIZATION OF LABOR SURPLUS AREA CONCERNS
52.222-3	APR 1984	CONVICT LABOR
52.222-26	APR 1984	EQUAL OPPORTUNITY
52.222-35	APR 1984	AFFIRMATIVE ACTION FOR SPECIAL DISABLED AND VIETNAM ERA VETERANS
52.222-36	APR 1984	AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS
52.222-37	JAN 1988	EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA
52.227-1	APR 1984	AUTHORIZATION AND CONSENT
52.227-2	APR 1984	NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT
52.227-11	JUN 1989	PATENT RIGHTS-RETENTION BY THE CONTRACTOR (SHORT FORM)
52.227-20	JUN 1987	RIGHTS IN DATA-SBIR PROGRAM
52.229-3	APR 1984	FEDERAL, STATE, AND LOCAL TAXES
52.229-5	APR 1984	TAXES -- CONTRACTS PERFORMED IN U.S. POSSESSIONS OR PUERTO RICO
52.232-1	APR 1984	PAYMENTS
52.232-11	APR 1984	EXTRAS
52.232-17	APR 1984	INTEREST
52.232-23	JAN 1986	ASSIGNMENT OF CLAIMS
52.233-1	APR 1984	DISPUTES

52.233-3	JUN 1985	PROTEST AFTER AWARD
52.243-1	AUG 1987	CHANGES -- FIXED PRICE ALTERNATE I (APR 1984)
52.245-2	APR 1984	GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS)
52.249-8	APR 1984	DEFAULT (FIXED-PRICE SUPPLY AND SERVICE)
52.249-4	APR 1984	TERMINATION FOR THE CONVENIENCE OF THE GOVERNMENT (SERVICES) (SHORT FORM)

I.2 PROMPT PAYMENT (52.232-25) (APR 1989)

Notwithstanding any other payment clause in this contract, the Government will make invoice payments and contract financing payments under the terms and conditions specified in this clause. Payment shall be considered as being made on the day a check is dated or an electronic funds transfer is made. Definitions of Pertinent terms are set forth in 32.902. All days referred to in this clause are calendar days, unless otherwise specified.

(a) Invoice Payments

(1) For purposes of this clause, "invoice payment" means a Government disbursement of monies to a Contractor under a contract or other authorization for supplies or services accepted by the Government. This includes payments for partial deliveries that have been accepted by the Government and final cost or fee payments where amounts owed have been settled between the Government and the Contractor.

(2) Except as indicated in subparagraph (a)(3) and paragraph (c) of this clause, the due date for making invoice payments by the designated payment be the later of the following two events:

(i) The 30th day after the designated billing office has received a proper invoice from the Contractor.

(ii) The 30th day after Government acceptance of supplies delivered or services performed by the Contractor. In a final invoice where the payment amount is subject to contract settlement actions, acceptance shall be deemed to have occurred on the effective date of the contract settlement. However, if the designated billing office fails to annotate the invoice with the actual date of receipt, the invoice payment due date shall be deemed to be the 30th day after the date the Contractor's invoice is dated, provided a proper invoice is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(3) The due date on contracts for meat and meat food products, contracts for perishable agricultural commodities, contracts for dairy products, edible fats or oils, and food products prepared from edible fats or oils, and contracts not requiring submission of an invoice shall be as follows:

(i) The due date for meat and meat food products, as defined in Section 2(a)(3) of the Packers and Stockyard Act of 1921 (7 U.S.C. 182(3)) and further defined in Pub. L. 98-181 to include any edible fresh or frozen poultry meat, an perishable poultry meat food product, fresh eggs, and any perishable egg product, will be as close as possible to, but not later than, the 7th day after product delivery.

(ii) The due date for perishable agricultural commodities, as defined in Section 1(4) of the Perishable Agricultural Commodities Act of 1930 (7 U.S.C. 499a(44)), will be as close as possible to, but not later than, the 10th day after product delivery, unless another date is specified in the contract.

(iii) The due date for dairy products, as defined in Section 111(e) of the Dairy Production Stabilization Act of 1983 (7 U.S.C. 4502(e)), edible fats or oils, and food products prepared from edible fats or oils, will be as close as possible to, but not later than the 10th day after the date on which a proper invoice has been received.

(iv) If the contract does not require submission of an invoice for payment (e.g., periodic lease payments), the due date will be as specified in the contract.

(4) An invoice is the Contractor's bill or written request for payment under the contract for supplies delivered or services performed. An invoice shall be prepared and submitted to the designated billing office specified in the contract. A proper invoice must include the items listed in subdivisions (a)(4)(i) through (a)(4)(viii) of this clause. If the invoice does not comply with these requirements, then the Contractor will be notified of the defect within 7 days after receipt of the invoice at the designated billing office (3 days for meat and meat food products and 5 days for perishable agricultural commodities, edible fats or oils, and food products prepared from edible fats or oils). Untimely notification will be taken into account in the computation of any interest penalty owed the Contractor in the manner described in subparagraph (a)(6) of this clause.

(i) Name and address of the Contractor.

(ii) Invoice date.

(iii) Contract number or other authorization for supplies delivered or services performed (including order number and contract line item number).

(iv) Description, quantity, unit of measure, unit price, and extended price of supplies delivered or services performed.

(v) Shipping and payment terms (e.g., shipment number and date of shipment, prompt payment discount terms). Bill of lading number and weight of shipment will be shown for shipments on Government bills of lading.

(vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).

(vii) Name (where practicable), title, phone number and mailing address of person to be notified in event of a defective invoice.

(viii) Any other information or documentation required by other requirements of the contract (such as evidence of shipment).

(5) An interest penalty shall be paid automatically by the Government, without request from the Contractor, if payment is not made by the due date and the conditions listed in subdivisions (a)(5)(i) through (a)(5)(iii) of this clause are met, if applicable. An interest penalty shall not be paid on contracts awarded to foreign vendors outside the United States for work performed outside the United States.

(i) A proper invoice was received by the designated billing office.

(ii) A receiving report or other Government documentation authorizing payment was processed and there was no disagreement over quantity, quality, or contractor compliance with any contract term or condition.

(iii) In the case of a final invoice for any balance of funds due the Contractor for supplies delivered or services performed, the amount was not subject to further contract settlement actions between the Government and the Contractor.

(6) The interest penalty shall be the rate established by the Secretary of the Treasury under Section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) that is in effect on the day after the due date, except where the interest penalty is prescribed by other governmental authority. This rate is referred to as the "Renegotiation Board Interest Rate," and it is published in the Federal Register semiannually on or about January 1 and July 1. The interest penalty shall accrue daily on the invoice payment amount approved by the Government and be compounded in 30-day increments inclusive from the first day after the due date through the payment date. That is, interest accrued at the end of any 30-day period will be added to the approved invoice payment amount and be subject to interest penalties if not paid in the succeeding 30-day period. If the designated billing office failed to notify the contractor of a defective invoice within the periods prescribed in paragraph (a)(4) of this clause, then the due date on the corrected invoice will be adjusted by subtracting the number of days taken beyond the prescribed notification of defects period. Any interest penalty owed the Contractor will be based on this adjusted due date. Adjustments will be made by the designated payment office for errors in calculating interest penalties, if requested by the Contractor.

(i) For the sole purpose of computing an interest penalty that might be due the Contractor, Government acceptance shall be deemed to have occurred

constructively on the 7th day (unless otherwise specified in this contract) after the Contractor delivered the supplies or performed the services in accordance with the terms and conditions of the contract, unless there is a disagreement over quantity, quality, or contractor compliance with a contract provision. In the event that actual acceptance occurs within the constructive acceptance period, the determination of an interest penalty shall be based on the actual date of acceptance. The constructive acceptance requirement does not, however, compel Government officials to accept supplies or services, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

(ii) The following periods of time will not be included in the determination of an interest penalty:

(A) The period taken to notify the Contractor of defects in invoices submitted to the Government, but this may not exceed 7 days (3 days for meat and meat food products and 5 days for perishable agricultural commodities, dairy products, edible fats or oils, and food products prepared from edible fats or oils).

(B) The period between the defects notice and resubmission of the corrected invoice by the Contractor.

(iii) Interest penalties will not continue to accrue after the filing of a claim for such penalties under the clause at 52.233-1, Disputes, or for more than 1 year. Interest penalties of less than \$1.00 need not be paid.

(iv) Interest penalties are not required on payment delays due to disagreement between the Government and Contractor over the payment amount or other issues involving contract compliance or on amounts temporarily withheld or retained in accordance with the terms of the contract. Claims involving disputes, and any interest that may be payable, will be resolved in accordance with the clause at 52.233-1, Disputes.

(7) An interest penalty shall also be paid automatically by the designated payment office, without request from the contractor, if a discount for prompt payment is taken improperly. The interest penalty will be calculated as described in subparagraph (a)(6) of this clause on the amount of discount taken for the period beginning with the first day after the end of the discount period through the date when the Contractor is paid.

(8) If this contract was awarded on or after October 1, 1989, a penalty amount, calculated in accordance with regulations issued by the Office of Management and Budget, shall be paid in addition to the interest penalty amount if the Contractor-

(i) Is owed an interest penalty;

(ii) Is not paid the interest penalty within 10 days after the date the invoice amount is paid; and

(iii) Makes a written demand, not later than 40 days after the date the invoice amount is paid, that the agency pay such a penalty.

(b) Contract Financing Payments

(1) For purposes of this clause, "contract financing payment" means a Government disbursement of monies to a Contractor under a contract clause or other authorization prior to acceptance of supplies or services by the Government. Contract financing payments include advance payments, progress payments based on cost under the clause at 52.232-16, Progress Payments, progress payments based on a percentage or stage of completion (32.102(e)(1)) other than those made under the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts, or the clause at 52.232-10, Payments Under Fixed-Price Architect-Engineer Contracts, and interim payments on cost type contracts.

(2) For contracts that provide for contract financing, requests for payment shall be submitted to the designated billing office as specified in this contract or as directed by the Contracting Officer. Contract financing payments shall be made on the (insert day as prescribed by Agency head; if not prescribed, insert 30th day) day after receipt of a proper contract financing request by the designated billing office. In the event that an audit or other review of a specific financing request is required to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the due date specified.

(3) For advance payments, loans, or other arrangements that do not involve recurrent submissions of contract financing requests, payment shall be made in accordance with the corresponding contract terms or as directed by the Contracting Officer.

(4) Contract financing payments shall not be assessed an interest penalty for payment delays.

(c) If this contract contains the clause at 52.213-1, Fast Payment Procedure, payments will be made within 15 days after the date of receipt of the invoice.

I.3 ELECTRONIC FUNDS TRANSFER PAYMENT METHODS (52.232-28) (APR 1989)

Payments under this contract will be made by the Government either by check or electronic funds transfer (through the Treasury Fedline Payment System (FEDLINE) or the Automated Clearing House (ACH)), at the option of the Government. After award, but no later than 14 days before an invoice or contract financing request is submitted, the Contractor shall designate a financial institution for receipt of electronic funds transfer payments, and shall submit this designation to the Contracting Officer or other Government official, as directed.

(a) For payment through FEDLINE, the Contractor shall provide the following information:

(1) Name, address, and telegraphic abbreviation of the financial institution receiving payment.

(2) The American Bankers Association 9-digit identifying number for wire transfers of the financing institution receiving payment if the institution has access to the Federal Reserve Communications System.

(3) Payee's account number at the financial institution where funds are to be transferred.

(4) If the financial institution does not have access to the Federal Reserve Communications System, name, address, and telegraphic abbreviation of the correspondent financial institution through which the financial institution receiving payment obtains wire transfer activity. Provide the telegraphic abbreviation and American Bankers Association identifying number for the correspondent institution.

(b) For payment through ACH, the Contractor shall provide the following information:

(1) Routing transit number of the financial institution receiving payment (same as American Bankers Association identifying number used for FEDLINE).

(2) Number of account to which funds are to be deposited.

(3) Type of depositor account ("C" for checking, "S" for savings).

(4) If the Contractor is a new enrollee to the ACH system, a "Payment Information Form," SF 3881, must be completed before payment can be processed.

(c) In the event the Contractor, during the performance of this contract, elects to designate a different financial institution for the receipt of any payment made using electronic funds transfer procedures, notification of such change and the required information specified above must be received by the appropriate Government official 30 days prior to the date such change is to become effective.

(d) The documents furnishing the information required in this clause must be dated and contain the signature, title, and telephone number of the Contractor official authorized to provide it, as well as the Contractor's name and contract number.

(e) Contractor failure to properly designate a financial institution or to provide appropriate payee bank account information may delay payments of amounts otherwise properly due.

I.4 CLAUSES INCORPORATED BY REFERENCE
(FAR 52.252-2) (JUN 1988)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

(End of Clause)

I.5 REMEDIES FOR ILLEGAL OR IMPROPER ACTIVITY (52.203-10) (MAY 1989)

(a) The Government, at its election, may reduce the price of a fixed price type contract or contract modification and the total cost and fee under a cost-type contract or contract modification by the amount of profit or fee determined as set forth in paragraph (c) of this clause if the head of the agency or his or her designee, determines that there was a violation of subsection 27(a) of the Office of Federal Procurement Policy Act (41 U.S.C. 423) as implemented in the FAR. In the case of a contract modification, the fee subject to reduction is the fee associated with the particular contract modification.

(b) Prior to making such a fee or profit reduction, the agency head or his or her designee shall provide to the Contractor a written notice of the action being considered and the basis therefor. The Contractor shall have a period determined by the agency head or his or her designee, but in no event less than 30 calendar days after receipt of such notice, to submit in person, in writing, or through a representative, information and argument in opposition to the proposed reduction. The agency head or his or her designee may, upon good cause shown, determine to reduce the contract or contract modification price or fee by an amount which is less than the amount determined under paragraph (c) of this clause.

(c) The price or fee reduction referred to in paragraph (a) of this clause shall be --

(1) For cost-plus-fixed-fee contracts, the amount of the fee specified in the contract at the time of award;

(2) For cost-plus-incentive-fee contracts, the target fee specified in the contract at the time of award notwithstanding any minimum fee or "fee floor" specified in the contract.

(3) For cost-plus-award-fee contracts --

(i) The base fee established in the contract at the time of contract award;

(ii) If no base fee is specified in the contract, 10 percent of the amount of each award fee otherwise payable to the contractor for each incentive period or at each award fee determination point.

(4) For fixed-price-incentive contracts, the Government may --

(i) Reduce the contract target price and contract target profit both by an amount equal to the initial target profit specified in the contract at the time of contract award;

(ii) When the contract provides for multiple deliverables, reduce the amount otherwise payable to the contractor upon each delivery and acceptance by an amount determined by the Contracting Officer to be the profit portion of each payable amount until the cumulative total of such reductions is equal to the initial target profit amount specified in the contract at the time of contract award;

(iii) In addition to any other withholdings, retentions or reserves, reduce the amount of progress payments otherwise payable in connection with each invoice or voucher properly submitted by the contractor for payment until the aggregate progress payments amounts so withheld equal the initial target profit established at the time of contract award; or

(iv) If the Government elects either (c)(4) (ii) or (iii) of this clause, at the time of total final price establishment, the price established in accordance with the incentive price revision provisions of the contract shall be reduced by an amount equal to the amount of initial target profit specified in the contract at the time of contract award and such reduced price shall be the total final contract price. Any progress payments amounts retained by the Government in (c)(4)(iii) of this clause shall be returned to the contractor, if appropriate.

(5) For firm-fixed-price contract or contract modifications, by 10 percent of the initial contract price; 10 percent of the contract modification price; or a profit amount determined by the Contracting Officer from records or documents in existence prior to the date of the contract award or modification.

(d) The Government may, at its election, reduce a prime contractor's price or fee in accordance with the procedures of paragraphs (b) and (c) of this clause for violations of the Act by its subcontractors by an amount not to exceed the amount of profit or fee reflected in the subcontract at the time the subcontract was first definitively priced.

(e) In addition to the remedy in paragraph (a) of this clause, the Government may terminate this contract or modification for default. The rights and remedies of the Government specified herein are not exclusive and are in addition to any other rights and remedies provided by law or under this contract.

I.6 PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (52.209-6) (MAY 1989)

(a) The Government suspends or debar Contractors to protect the Government's interests. Contractors shall not enter into any subcontract equal to or in excess of \$25,000 with a Contractor that has been debarred, suspended, or proposed for debarment unless there is a compelling reason to do so. If a Contractor intends to subcontract with a party that is debarred, suspended, or proposed for debarment (see FAR 9.404 for information on the list of Parties Excluded from Procurement Programs), a corporate officer or designee of the Contractor shall notify the Contracting Officer, in writing, before entering into such subcontract. The notice must include the following:

- (1) The name of the subcontractor;
- (2) The Contractor's knowledge of the reasons for the subcontractor being on the list of Parties Excluded from Procurement Programs;
- (3) The compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion on the list of Parties Excluded from Procurement Programs; and
- (4) The systems and procedures the Contractor has established to ensure that it is fully protecting the Government's interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

(b) The Contractor's compliance with the requirements of 52.209-6 will be reviewed during Contractor Purchasing System Reviews (see FAR Subpart 44.3).

1.7 DRUG-FREE WORKPLACE (FAR 52.223-6)

(a) Definitions. As used in this clause,

"Controlled substance" means a controlled substance in schedules I through V of section 202 of the Controlled Substances Act (21 U.S.C. 812) and as further defined in regulation at 21 CFR 1308.11-1308.15.

"Conviction" means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes.

"Criminal drug statute" means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, possession or use of any controlled substance.

"Drug-free workplace" means a site for the performance of work done in connection with a specific contract at which employees of the contractor are prohibited from engaging in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance.

"Employee" means an employee of a contractor directly engaged in the performance of work under a Government contract.

"Individual" means an offeror/contractor that has no more than one employee including the offeror/contractor.

(b) The Contractor, if other than an individual, shall --

(1) Publish a statement notifying its employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition;

(2) Establish a drug-free awareness program to inform such employees about--

(i) The dangers of drug abuse in the workplace;

(ii) The contractor's policy of maintaining a drug-free workplace;

(iii) Any available drug counseling, rehabilitation, and employee assistance programs; and

(iv) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace.

(3) Provide all employees engaged in performance of the contract with a copy of the statement required by subparagraph (b)(1) of this clause;

(4) Notify such employees in the statement required by subparagraph (b)(1) of this clause, that as a condition of continued employment on this contract, the employee will --

(i) Abide by the terms of the statement; and

(ii) Notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than five (5) days after such conviction.

(5) Notify the Contracting Officer within ten (10) days after receiving notice under subdivision (a)(4)(ii) of this clause, from an employee or otherwise receiving actual notice of such conviction;

(6) Within 30 days after receiving notice under subparagraph (a)(4) of this clause of a conviction, impose the following sanctions or remedial measures on any employee who is convicted of drug abuse violations occurring in the workplace:

(i) Taking appropriate personnel action against such employee, up to and including termination; or

(ii) Require such employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency.

(7) Make a good faith effort to maintain a drug-free workplace through implementation of subparagraphs (b)(1) through (b)(6) of this clause.

(c) The Contractor, if an individual, agrees by award of the contract or acceptance of a purchase order, not to engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in the performance of this contract.

(d) In addition to other remedies available to the Government, the Contractor's failure to comply with the requirements of paragraphs (b) and (c) of this clause may, pursuant to FAR 23.506, render the contractor subject to suspension of contract payments, termination of the contract for default, and suspension or debarment.

I.8 RESTRICTIONS ON CONTRACTING WITH SANCTIONED PERSONS (52.225-13) (MAY 1989)

(a) Definitions. (1) "Component part," means any article which is not usable for its intended functions without being imbedded or integrated into any other product and which, if used in production of a finished product, would be substantially transformed in that process.

(2) "Finished product," means any article which is usable for its intended function without being imbedded in, or integrated into, any other product. It does not include an article produced by a person, other than a sanctioned person, that contains parts or components of the sanctioned person if the parts or components have been substantially transformed during production of the finished product.

(3) "Sanctioned person," means a company or other foreign person upon whom prohibitions have been imposed.

(4) "Substantially transformed," when referring to a component part or finished product, means that the part or product has been subjected to a substantial manufacturing or processing operation by which the part or product is converted or combined into a new and different article of commerce having a new name, character, and use.

(b) General. Section 2443 of the Multilateral Export Control Enhancement Amendments Act (Pub. L. 100-418) and Executive Order 12661, effective December 28, 1988, impose, for a period of 3 years, with certain exceptions, a prohibition on contracting with, or procuring (including rental and

lease/purchase) directly or indirectly the products or services of (1) Toshiba Machine Company, (2) Kongsberg Trading Company, (3) Toshiba Corporation, or (4) Kongsberg Vaapenfabrikk. The Act and Executive Order also prohibit, for the same 3-year period, the importation into the United States of all products produced by Toshiba Machine Company and Kongsberg Trading Company. These prohibitions also apply to subsidiaries, successor entities or joint ventures of Toshiba Machine Company or Kongsberg Trading Company.

(c) Restriction. Unless listed by the Contractor in its offer, in the solicitation provision at FAR 52.225-12, Notice of Restrictions on Contracting with Sanctioned Persons, or unless one of the exceptions in paragraph (d) of this clause applies, the Contractor agrees that no products or services delivered to the Government under this contract will be products or services of a sanctioned person.

(d) Exceptions. The restrictions apply --

(1) To finished products of nonsanctioned persons containing components of a sanctioned person if these components have been substantially transformed during the manufacture of the finished product.

(2) To products or services of a sanctioned person provided --

(i) The products are designed to the specifications of a nonsanctioned person marketed under the trademark, brand or name of the nonsanctioned person;

(ii) The business relationship between the nonsanctioned person and the sanctioned person clearly existed prior to June 30, 1987; and

(iii) The nonsanctioned person is not directly or indirectly owned by a sanctioned person.

(3) If a determination has been made in accordance with FAR 25.1003 (a) or (b).

(e) Award. Award of any contract resulting from this solicitation will not affect the Contractor's obligation to comply with importation regulations of the Secretary of the Treasury.

(End of clause)

I.9 DISCOUNTS FOR PROMPT PAYMENT (52.232-8) (APR 1989)

(a) Discounts for prompt payment will not be considered in the evaluation of offers. However, any offered discount will form a part of the award, and will be taken if payment is made within the discount period indicated in the offer by the offeror. As an alternative to offering a

prompt payment discount in conjunction with the offer, offerors awarded contracts may include prompt payment discounts on individual invoices.

(b) In connection with any discount offered for prompt payment, time shall be computed from the date of the invoice. For the purpose of computing the discount earned, payment shall be considered to have been made on the date which appears on the payment check or the date on which an electronic funds transfer was made.

(End of Clause)

PART III - LIST OF DOCUMENTS, EXHIBITS, AND OTHER ATTACHMENTS

Section J - List of Attachments

Attachment Number	Title
1	NRC Contractor Organizational Conflicts of Interest
2	NRC Manual Chapter 3202
3	Billing Instructions for Fixed Price Contracts
4	Contractor's Technical Proposal dated March 24, 1989, in response to the FY89 Small Business Innovative Research Program (SBIR)

APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR 89)
PHASE I - FY 1989
PROJECT SUMMARY

FOR NRC USE ONLY

Program Office TIM Proposal No. Topic No.

TO BE COMPLETED BY PROPOSER

Name and Address of Proposer

Gamma Engineering Corporation
15215 Shady Grove Road, #202
Rockville, MD 20850

Name and Title of Principal Investigator

Herbert Feinroth, President

Title of Project

Use of Ceramic Fuel Cladding to Reduce the Severity of LWR Accidents

Technology, Research Thrust and/or Potential Commercial Application (Limit to 8 words)

Fuel element cladding; ceramics; fuel failure margins

Technical Abstract (Limit to 200 words) This project investigates the feasibility of using ceramic cladding materials to replace the metallic cladding materials now used with water reactor fuel. Should feasibility be determined, and eventually commercialized, the ability of water reactors to withstand severe accidents would be enhanced. With today's metal clad fuel, a relatively short time period is available after a loss of coolant accident before emergency core cooling systems must recover the core to prevent fuel damage. The metal cladding loses its strength at relatively low temperatures (2200° F). Furthermore, when the metal clad does overheat and is subsequently quenched with water, it reacts exothermically to produce additional heat. Although the fuel pellets themselves are ceramics, with melting temperatures on the order of 5000° F, cladding which supports and contains the fuel pellets has always been fabricated using lower melting metal alloys; ceramics with the required strength and ductility were simply not available. Recent technical advances in the field of ceramics has produced new materials with dramatic increases in ductility, strength and fabricability. This project investigates whether these new developments will permit use of ceramic fuel cladding and, thereby, reduce the potential severity of certain accidents in water cooled reactors.

Anticipated Results/Implication of the Approach (both Phase I and II/Potential Commercial Application of Research)

If successful, Phase I research will identify promising new ceramic materials that have the required nuclear properties as well as strength, ductility, and fabricability characteristics for use as cladding materials on commercial reactor fuel elements. Phase II research will evaluate selected materials via bench scale tests in conjunction with both ceramics fabricators and commercial nuclear fuel vendors to confirm the commercial viability of these new materials. If commercially viable, future reactor fuel systems can be built with much greater resistance to severe accidents than current reactor fuel systems.

c. Identification and Significance of the Problem or Opportunity

A major objective of severe accident research has been to increase our understanding of the physical processes that occur during loss of coolant, or loss of heat removal accidents in commercial water reactors. Additional research is focused on the use of new, more passive engineering features and man-machine interfaces which will help reduce the probability and consequences of severe core damage accidents.

To date, very little of this research has been focused on how to make the reactor core itself more resistant to damage in the first place. The assumption is generally made that water reactor fuel of the future will continue to be made from the traditional metal (generally zirconium alloys) clad uranium oxide fuel pellets that have characterized U.S. commercial water reactors ever since the Shippingport reactor started up in 1957. While these water reactor fuel element cladding materials have proven very reliable in over 30 years of service in commercial water reactors throughout the world, they do have one very significant drawback as compared to alternative fuel cladding being considered for high temperature gas reactors; namely, they soften and melt at relatively low temperatures as compared to the ceramic fuel which they contain. In addition, when they do overheat and melt, as might occur in a loss of coolant accident such as occurred at TMI, they react exothermically with the coolant producing yet more heat thus exacerbating the rise in fuel temperatures and the severity of the core damage. Consequently, the time available for the engineered safety features and human intervention to prevent severe core damage after a loss of coolant accident is often very short; sometimes fractions of an hour. This puts great pressure on the design of future advanced water reactors to increase the thermal margins in the core, simplify the design of primary and backup heat removal systems, and improve the man-machine interface. While these improvements, which are the focal point of the current EPRI-DOE Advanced LWR Program, are indeed useful in further reducing the residual risk of future water reactors, they don't achieve the significant improvements in reducing severe accident risk that appear to be achievable with ceramic-clad fuel such as those being designed for high temperature gas reactors.

While this proposed research project is only exploratory in nature, and would have to be followed by extensive development on the part of reactor suppliers to fully develop the concept, the significance of successfully developing a ceramic-clad fuel for water reactors would be

very profound. Specifically, it would bring to the water cooled reactors, with which the U.S. and the world already has much successful experience, the major advantage being claimed for high temperature gas reactors; namely, a fuel system which is significantly more resistant to severe core damage, regardless of the cause of the accident and reliability of the engineered safety systems.

d. Background, Technical Approach and Anticipated Benefits.

1.a. Background: The accepted design for nuclear fuel assemblies in the majority of water reactors in the United States is based on the use of Zircaloy cladding materials as a housing for the nuclear fuel pellets. 10CFR 50.46 restricts the maximum temperature of the Zircaloy cladding during a design basis loss of coolant accident to 2200° F. Recent advances in the development of high strength ceramic materials may allow for much higher temperatures by substituting ceramic materials as a fuel cladding. Ceramics are well known for their abilities to withstand temperatures of over 5000° F. The problem with ceramics has, heretofore, been their low tensile strength and toughness as compared to that of metallic materials. A related problem for water cooled reactors has been that the geometric configuration of the individual fuel element or rod; namely, a very long 12 foot long tube of small diameter (0.37 inches for a typical PWR), with significant internal pressure resulting from fission gas release, has required an extremely ductile structural material as the main cladding material. This requirement for a ductile pressure vessel to house the fuel pellets has, heretofore, precluded the consideration of ceramics as a fuel element cladding material for water reactors.

A review of recent developments in advanced ceramics was published in the mid-June 1988 issue of the "1988 Guide to Engineered Materials" published by the Journal "Advanced Materials and Processes." In this review it is stated that:

"Toughness measurements have been made in ceramics only in the last 15 years.

Materials scientists are working hard to improve the toughness of ceramics. One material in particular benefitting from this work is zirconia (ZrO_2). Partially stabilized, transformation-toughened zirconia gains a three-fold strength and toughness advantage over unmodified ZrO_2 .

In transformation-toughened materials (ZrO_2 , Al_2O_3 , and Si_3N_4 matrices, all with a dispersed ZrO_2 tetragonal phase) a phase transformation occurs in the region of applied stress within the material, which absorbs energy at the tip of the advancing crack, arresting its propagation and significantly boosting both strength and toughness.

A number of other strategies can be used to toughen ceramic composites including matrix microcracking, fiber debonding or crack deflection, and fiber pullout. If matrix microcracking can be limited to the stress field of a primary crack, energy is dissipated without promoting further crack growth. The ideal materials for this approach are those with strong fibers securely bonded in a relatively weak matrix. In these materials, growth of the microcracks is arrested by the reinforcing fibers. Cracks are deflected in strong-matrix composites containing weakly bonded, strong fibers by the mechanism of fiber debonding.

Interfacial tension due to differences in thermal expansion between matrix and fibers in a composite also can provide a toughening effect. If the matrix is placed in tension as the composite is cooled from fabrication temperature (expansion coefficient of the matrix is greater than that of the fibers), matrix microcracking and the attendant primary-crack attenuation are promoted. If the difference in thermal expansion favors the fibers, fiber debonding in the stress field of a crack will be the toughening mechanism.

A 'hybrid composite' approach using both large and small diameter fibers has been studied as a way to maximize both strength and toughness. A low concentration of large-diameter fibers enhances the strength of such a material, while the small fibers provide toughness. The two types of fibers function somewhat cooperatively to both suppress and stabilize matrix cracks."

As an example of what can be achieved in modern ceramics of relevance to nuclear fuel cladding applications, the "1988 Guide to Engineered Materials" also reports that Zycron TTZ (transformation toughened zirconia) developed by Corning Glass "has room temperature

tensile strength near that of steel with better wear and corrosion resistance."

1.b. Technical Approach:

Our approach to Phase I is to first identify promising new developments in ceramics technology which have the potential for development of a high strength ceramic for use as a nuclear fuel cladding material, and in parallel to evaluate alternative geometric configurations of possible fuel elements which use this ceramic cladding and which meet the required thermal, hydraulic and mechanical loadings imposed during normal, abnormal and accident conditions. The result will be a determination of the feasibility of using ceramic cladding in water reactor fuel, identification of one or more candidate ceramic materials and geometric configurations, and a Phase II program plan designed to confirm feasibility via conceptual design calculations and bench scale materials tests. This technical approach will involve three major phases as follows:

First, we will identify physical characteristic requirements for cladding materials assuming conventional fuel-cladding configurations. These requirements will include such properties as tensile and compression strength, fatigue, toughness, sheer strength, thermal properties such as thermal shock resistance, thermal creep resistance, thermal expansion and conductivity, and corrosion under high temperatures. Also of prime importance is the neutronic performance of ceramic materials.

Second, we will compare the requirements identified above with the properties of the most promising high strength ceramics materials. Our survey of candidate materials will include direct interaction with those currently in the forefront of current research on structural ceramics including both commercial as well as academic research institutions. Among the commercial firms, we will include the Corning Glass Company, developers of the transformation toughened zirconia that is reported to have room temperature tensile strength near that of steel. We will include University Research Centers doing significant research on structural ceramics, such as the Pennsylvania State University Resources Research Center and Battelle Columbus. We will also interact with at least one Light Water Reactor Fuel Supplier (such as the Babcock & Wilcox Fuel Company with which Gamma has served as subcontractor on other nuclear fuel-related research). From these comparisons, the most promising ceramic materials will be identified, as well as those materials which could be improved to the point of being acceptable materials.

Third, we will explore alternative geometric configurations which take advantage of the material properties of ceramics, while minimizing the departures from present practice. These alternative configurations may include re-shaping the geometry of the cladding, its structural support within the reactor, the methods of manufacture, fabrication, storage and handling of the fuel elements themselves, and the configuration of the ceramic fuel. An example of one geometric configuration which will be considered is the fuel bundle concept used in the original Shippingport blanket fuel. These were approximately 12" long fuel rods joined together by welded end structures.

A preliminary assessment will be made of the performance of ceramic-clad fuel under the different geometric configurations, and a determination of feasibility will be made.

Based on the above work, we will either conclude that the concept is feasible and develop a Phase II program for confirmation of feasibility or, alternatively, we will conclude that use of ceramic cladding is not yet feasible and will recommend no further Phase II work at this time.

2. Anticipated Results of the Phase I Research.

2.a. Anticipated Benefits: The potential benefit of the proposed research is that it could lead to commercial development and application of fuel materials in licensed reactors which are substantially more resistant to severe core damage during postulated accidents than traditional metal-clad fuel. This could result in significant reduction in the residual risk of reactor operation and, thereby, significantly improve both the public acceptance of nuclear power as well as the ease of licensing future reactors.

2b. Estimated Total Cost of the Project: It is estimated that the total cost of the Phase I research effort will not exceed \$49,384. Should Phase I research identify that ceramic cladding is feasible for water reactors, a Phase II research program will be proposed to evaluate new ceramic materials using bench scale tests, and to develop a conceptual fuel element and design possible alternative fuel and core configurations. It is anticipated that the Phase II program will cost less than \$150,000. If successful, subsequent development and commercial deployment will be accomplished with private funds.

2c. Policy Issues Which May Be Affected By the Results: If the research is successful, this will have a direct benefit in supporting the continued licensing of advanced water reactors under NRC's severe accident policy, as well as potential benefit in license renewal of existing reactors when refueled with ceramic-clad fuel.

3. Significance of Phase I Efforts as a Foundation for Phase II: Phase I research will identify the most promising ceramic materials which have the greatest likelihood of successful application as nuclear fuel cladding material for water reactors under high temperatures and pressures. If evaluation determines that use of such materials as cladding is indeed feasible, the results of Phase I will provide direct input to Phase II. In addition to investigating the properties of materials, Phase I efforts will identify current relevant research in the field of ceramics, and will provide a database from which Phase II will benefit. Specifically, at least one candidate ceramic material will be identified which comes closest to meeting the nuclear, thermal, hydraulic and mechanical requirements of water reactor fuel cladding. Material property needs in the temperature range of interest will be identified. This will serve as a test matrix for Phase II. In addition, Phase I will identify at least one practical and coolable geometry for applying this cladding material to a reactor core design. This geometry will be modeled and serve as a basis for criticality, depletion, thermal hydraulic and LOCA (Loss of Coolant Accident) calculations in Phase II.

e. Phase I Technical Objectives.

The specific objectives of the Phase I research are as follows:

1. The first objective will be to evaluate the feasibility (and identify candidate materials) of using ceramic materials as cladding for water reactor fuel. The evaluation will consider all required cladding performance requirements including neutronic properties such as maximum allowable absorption cross section versus energy level, and physical properties such as compressive and tensile strength, thermal properties, resistance to corrosion and irradiation effects, and fabricability.

2. A second, parallel objective will be to evaluate alternative geometric configurations of fuel elements which take advantage of the inherent strengths of ceramic cladding.

3. If the first two objectives are achieved, then a third objective of Phase I research is to develop a Phase II test and analysis program which (a) will confirm the feasibility and economic viability of the ceramic cladding, and (b) provide sufficient bases for commercial interest in development and deployment, following distribution of Phase II results.

f. Phase I Work Plan.

Task 1 - Definition of Required Properties: This task will involve a brief compilation, using existing water reactor design information, of the fuel clad materials properties which are required under typical water reactor operating conditions. Specific properties to be compiled are:

1. Structural Properties (as a function of temperature and irradiation):

- Tensile Strength/Ductility
- Compressive Strength
- Sheer Strength
- Bending Moment
- Flexural Strength
- Toughness
- Fatigue

2. Thermal Properties:

- Thermal and Irradiation Induced Creep Resistance
- Thermal Shock Resistance
- Thermal Conductivity
- Thermal Expansivity
- Specific Heat

3. Chemical Properties:

- Corrosion Resistance
- High Temperature Chemical Behavior
- Stability in Water
- Absence of interaction with UO_2 fuel and fission product gases.

4. Physical Properties:

- Wear Resistance
- Permeability (to fission gases)

5. Neutronic Properties:

- Absorption Cross-Section versus Energy Level

Task 2 - Materials Research and Identification: This task involves researching state-of-the-art developments in the area of high strength structural ceramics. Technologies such as transformation toughening, fiber reinforcement, and microcracking will be examined for their applications in fuel cladding. Numerous universities are presently conducting research in advanced structural ceramics, as are government-sponsored laboratories and private research concerns. This task will involve contacting those doing work in this field to determine the overall technical feasibility of applying ceramics to the cladding application. For example, the work at Corning Glass on Zycron TTZ is of particular interest. We will investigate with relevant Corning personnel what is now known about this material with respect to the requirements of nuclear service, and what work would be required to develop the missing data required to make a feasibility determination.

A sample listing of recent and ongoing ceramics research which we will review and use as a basis for our evaluation includes the following:

1. Development of zirconia-toughened spinel, K. P. D. Lagerlof, Dept. of Metallurgy and Materials Science, Case Western Reserve University, Cleveland, OH.

2. Superplastic forging of structural ceramics, R. Raj, Dept. of Materials Science and Engineering, Cornell University, Ithaca, NY, (Project Sponsor - Jupiter Tech).

3. Structural toughening of composites by 3-D fiber architecture, F. Ko and C. Pastore, Dept. of Materials Engineering, Drexel University, Philadelphia, PA.

4. Chemistry-based synthesis and processing of ceramics and ceramic composites applicable to space structures and high-temperature structures such as advanced propulsion systems, H. K. Bowen and W. E. Rhine,

Ceramics Processing Research Lab., Materials Processing Center, Cambridge, MA, (Project Sponsor - Air Force Office of Scientific Research).

5. Identification and quantification of scientific principles underlying successful processing of ceramic powders, and the development of fabrication processes and manufacturing systems to improve products, H. K. Bowen, R. L. Pober, J. J. Cima, and W. E. Rhine, Ceramics Processing Research Lab., Materials Processing Center, Cambridge, MA.

6. Fracture and toughening of ceramics, K. T. Faber, Depts. of Materials Science and Engineering, Chemistry, Civil Engineering, Electrical Engineering/Computer Science, Geology, Mechanical/Nuclear Engineering, and Physics, Northwestern University, Evanston, IL, (Project Sponsors - National Science Foundation and Presidential Young Investigators).

7. Ceramic composite component fabrication, M. Amateau, G. L. Messing, and J. R. Hellmann, Dept. of Materials Science and Engineering, Pennsylvania State University, University Park, PA, (Project Sponsor - Gas Research Institute).

8. Fabrication and characterization of ceramic-matrix composites for high-temperature structural applications, J. R. Hellmann, Dept. of Materials Science and Engineering, Pennsylvania State University, University Park, PA, (Project Sponsor - Penn State Research Initiation Grant).

9. Machining processes and products for advanced ceramics, J. McKee and R. E. Tressler, Dept. of Materials Science and Engineering, Pennsylvania State University, University Park, PA, (Project Sponsor - Ben Franklin Partnership, McKee Carbide Tool Co.).

10. Long-term reliability of commercial ceramics for high-temperature structural applications, R. E. Tressler, Dept. of Materials Science and Engineering, Pennsylvania State University, University Park, PA (Project Sponsor - Cooperative Program in High-Temperature Engineering Materials Research).

11. Transformation-toughening of ceramics, W. R. Cannon, L. Braun, J. Han, J. Rydzak, R. Petrany, T. Tsalkalakos, E. M. DeLiso, L. Johnson, and Z. Kalman, Dept. of Ceramics, Rutgers University, Piscataway, NJ (Project Sponsor - Center for Ceramics Research, Rutgers University).

12. Strengthening and toughening mechanisms in fiber-reinforced ceramic composites, R. L. Lehman, V. A. Greenhut, J. B. Wachtman, Jr., C. A. Zern, and R. Caracciolo, Rutgers University, Piscataway, NJ (Project Sponsor - Center for Ceramics Research, Rutgers University).

13. Development of zirconia high-performance engineered ceramics, M. Berg, Dept. of Materials Science and Engineering, University of Illinois, Urbana, IL (Project Sponsor - W. R. Grace & Co.).

14. Development of high-strength ZrO₂ ceramics, R. C. Buchanan, Dept. of Materials Science and Engineering, University of Illinois, Urbana, IL (Project Sponsor - Office of Naval Research).

15. High-temperature ceramic-fiber-ceramic-matrix composites for aerospace applications, R. E. Moore and D. E. Day, Dept. of Ceramic Engineering, University of Missouri-Rolla, Rolla, MO (Project Sponsor - McDonnell-Douglas Aircraft Co.).

16. Failure modes and toughening mechanisms in ceramic-matrix composites, R. E. Moore, Dept. of Ceramic Engineering, University of Missouri-Rolla, Rolla, MO (Project Sponsor - Weldon Springs).

17. High-temperature corrosion of ceramics, J. R. Blachere and F. S. Pettit, Dept. of Materials Science and Engineering, University of Pittsburgh, 848 Benedum Hall, Pittsburgh, PA (Project Sponsor - Dept. of Energy).

18. Fracture resistance of structural ceramics, R. C. Bradt, Dept. of Materials Science and Engineering, University of Washington, Seattle, WA (Project Sponsor - Martin Marietta).

Task 3 - Evaluation: Based on the assumption that Tasks 1 and 2 will identify candidate ceramic materials with suitable properties, we will conduct scoping analyses to evaluate the feasibility of applying such ceramic materials as substitutes for the traditional Zircaloy cladding in a typical PWR. These evaluations will consider alternative configurations of fuel geometries, if necessary, to properly support and cool the ceramic-clad fuel elements.

3.1 Neutronic: Determine the feasibility of using ceramic cladding from a nuclear physics standpoint.

- a. Consider a ceramic material of sufficient strength and ductility that it can be directly substituted for Zircaloy cladding in a standard PWR.
- b. Select a typical PWR design for comparison.
- c. Make a crude estimate of the effect on reactivity of the ceramic isotopic distribution as compared to the Zircaloy isotopic distribution.
- d. Estimate the change in fuel enrichment that would be required to compensate for the reactivity changes from (c).
- e. Estimate changes in burnable poison required to compensate.
- f. Draw conclusions on neutronic feasibility.

3.2 Thermal - Operational: Assume the same flow conditions and heat transfer rates from fuel to coolant as in typical PWR. Calculate the temperature distribution across a typical fuel pellet-gap-clad cross section under average and peak heat flux conditions. Evaluate the implications of that temperature distribution to the performance and the integrity of the ceramic cladding material.

3.3 Accident - Uncovered Core: Make a rough estimate of the improvement in performance (reduced accident severity) during a core recovery accident. Perform a series of crude, steady state calculations, with various decay heat levels (e.g., 1/2% - 1% - 3%) to determine the temperature at which the reactor vessel and ceramic clad fuel pins must reach in order to achieve heat flow balance to the containment. Compare this with the very low decay heat level (also to be calculated) that a metal clad fuel can tolerate without melting and still achieve heat flow equilibrium to the containment atmosphere.

3.4 Fuel Assembly Support and Control: Evaluate the feasibility of providing adequate lateral support to the fuel rods using ceramic spacers in lieu of traditional metallic spacers.....assume same vertical spacing. Also, evaluate the feasibility of providing ceramic upper and lower fuel assembly support structures which are capable of being supported within a steel pressure vessel. Consider implications and alternatives for control rod design compatible with a high temperature ceramic core.

Task 4 - Bench Test Requirements and Review with Commercial Nuclear Fuel Vendor: This task will involve contacts with at least one nuclear fuel

vendor for an assessment of commercial feasibility and determination of testing and analysis requirements at the bench test level anticipated for Phase II. These tests and analyses will be designed to assess the performance of ceramic-cladding materials under conditions simulating those in a nuclear reactor to determine their performance. The Phase II tests and analyses will be designed to evaluate thermal, chemical, neutronic, and structural performance of various configurations of fuel and cladding.

Task 5 - Final Report: This task will involve the preparation of the final report on the feasibility of ceramics as a nuclear fuel-cladding material for water cooled reactors, based on the results of Phase I research. This report will present detailed findings of all tasks in written and graphical form, along with supporting bibliographies, and lists of contacts of appropriate organizations which were consulted during this study. Recommendations will be made concerning the continuation of research into Phase II, with supporting documentation. Alternative material and geometric configurations, as appropriate, will be presented and evaluated relative to their technical and economic feasibility.

g. Phase I Statement of Work.

1. Project Objective: The contractor shall investigate the availability of advanced ceramic materials having the required neutronic properties, as well as mechanical, chemical and thermal properties, to serve as cladding on modern water reactor fuel elements. The contractor shall evaluate the feasibility of such ceramic-cladding materials as compared to traditional metallic cladding, in terms of core performance (neutronics as well as fuel integrity) and practicability of fabrication, and estimate the improvements in severe accident safety that could result from the development and commercialization of such ceramic cladding materials.

2. Scope of Work: The work to be performed consists of the following tasks:

2.1 Definition of required properties: A short matrix of required nuclear properties (maximum allowable absorption cross-section versus energy level); and materials properties (ductility, strength, chemical inertness, fabricability, minimum acceptable operating temperatures both normal and accident, etc.) will be developed for use in the study.

2.2 Research and identification of materials meeting the nuclear and materials requirements identified in Task 1. This will involve literature searches as well as contacts with university and commercial researchers in the ceramics field.

2.3 Analysis and evaluation of application of ceramic cladding materials in a typical PWR design. This will involve development of preliminary concepts of fuel cladding support arrangements using candidate materials, and assessment of their performance as compared to metal clad fuel elements.

2.4 Review with commercial nuclear fuel vendor for commercial viability and identification of Phase II bench test requirements.

2.5 Final report preparation.

3. Performance Schedule:

Task 2.1 - Complete one (1) month after start of work.

Task 2.2 - Complete three (3) months after start of work.

Tasks 2.3 and 2.4 - Complete five (5) months after start of work.

Task 2.5 - Complete six (6) months after start of work.

4. Deliverable: The contractor shall provide a final report containing the results of his survey of advanced ceramics materials and conclusions regarding the feasibility of using these materials as cladding for water reactor fuel elements, and the potential effect on reducing the severity of potential accidents which would result from commercial use of such materials.

h. Facilities and Equipment.

Phase I work will be done at Gamma Engineering facilities in Rockville, Maryland, where word processing, laser printing, duplication micro-processors are available for use on this project. In the event Phase II follow-on work is required, arrangements will be made with Penn State University's Nuclear Engineering Department for simplified reactor engineering calculations (neutronics, thermal and hydraulics, accident

analyses) and with the Babcock & Wilcox R&D Division and/or commercial ceramics producers for bench scale testing of promising ceramics materials.

i. Consultants.

Dr. Samuel Levine, Professor of Nuclear Engineering at Penn State University, will provide consultant services to Gamma during the course of this contract. Dr. Levine was Director of Penn State's Breazeale Nuclear Research Reactor for 1968 to 1986 and has expertise in many aspects of reactor design, especially in fuel element design and in core fuel management. Dr. Levine will provide evaluation advice and analyses of the nuclear physics aspects of ceramic-cladding materials, and will also arrange for simplified thermal hydraulic calculations of alternative geometric arrangements where necessary, using existing Penn State Nuclear Engineering Department computer codes. A brief summary of Dr. Levine's experience is listed in Section Q.

i. Related Work.

Mr. Feinroth the proposed Principal Investigator for this research, currently serves as principal consultant to the Scientific Secretary of the Nuclear Energy Agency (NEA) of the OECD in connection with NEA's current study of Advanced Water Reactor Technology. This study is being conducted by nuclear experts from 13 NEA countries and is to be published later in 1989. The advanced technologies include features which are designed to reduce the residual risk of water reactor operation via more passive design of engineered safety systems and other means. This work has given Mr. Feinroth first-hand knowledge of the most recent developments, worldwide, in advanced water reactor technology. However, more of this work is directly related to development of ceramic cladding for water reactor fuel.

Earlier in Mr. Feinroth's career, he served as Project Manager for the Naval Reactors Branch of the AEC for the development, fabrication and operation of a new, ceramic wafer-type fuel element (PWR Core 2) which was successfully operated at Shippingport Core 2. The seed of PWR Core 2 used metallic-clad plates containing ceramic wafers of $UO_2 - ZrO_2$ stabilized with CaO . The fuel element was developed by the Bettis Laboratory under the direction of the Naval Reactors Branch. Many of the design and fabrication problems which were overcome in this successful project will be valuable background in the conduct of this proposed SBIR research.

k. Key Personnel.

Mr. Herbert Feinroth, President of Gamma Engineering Corporation, will be the principal investigator for the proposed research program. He will develop the initial materials requirements, provide direction to the investigation of promising ceramic materials which meet those requirements, participate in discussions with researchers doing work on such ceramics, perform the conceptual design of alternative fuel element configurations and prepare the final report.

Mr. Feinroth is well qualified to direct and conduct this research. He has over 30 years experience as a nuclear power engineer and manager, much of which involved the design and technology development of reactor fuel and core designs. In addition to the work on advanced ceramic fuels for PWR Core 2, mentioned in Section J above, Mr. Feinroth was directly responsible for directing the development and design work for the fuel and reactor cores used for the U.S.S. Nimitz and also managed the Core Manufacturing branch of the Naval Reactors Division of the AEC. More recently, Mr. Feinroth served as Assistant Director for Technology of the AEC's Reactor Development Division where he managed development programs in the areas of nuclear physics, chemistry, fuel element development, and core design. This latter assignment focused on the development of advanced fuel systems for liquid metal cooled fast breeder reactors. A summary of Mr. Feinroth's experience is covered in Section Q.

Mr. Albert Ream, a part-time employee of Gamma Engineering, will assist in performing the proposed research. Mr. Ream received a Bachelor of Science degree in Civil Engineering from the University of Pittsburgh in 1972 and has been practicing as a civil engineer and energy systems engineer since that time. This includes positions as Project Manager (Civil Engineer) for the Federal Energy Regulatory Commission from 1976-1979, and Director of Engineering Services for Solar Science Industries, Inc., from June 1980 to September 1981. Mr. Ream will be responsible for conducting the investigation into available ceramics materials and the relevance to potential cladding applications of ongoing research into advanced ceramics. He will also draft portions of the final report covering the results of these investigations.

l. Potential Post Applications.

If the proposed research project does indeed determine the feasibility of the ceramic-fuel cladding for water reactor fuel and, if Phase II of the

project confirms the economic potential as well as potential safety advantages of ceramic cladding, then it is expected that commercial reactor suppliers will be interested in investing private funds for commercial development and application. Because ceramic fuel can withstand much higher temperatures before damage is incurred, the use of such fuel in both existing reactors as well as future advanced reactors could lead to reduced risk of down-time due to accidents, as well as reduced risk of accidental release of radioactivity from nuclear plant operations. With respect to NRC's regulatory activities, use of ceramic-clad fuel could significantly reduce the analytical effort required by both applicant and staff to demonstrate adequate resistance to severe accident scenarios.

With regard to Federal Government applications, the use of ceramic cladding may be of value in improving the performance potential of advanced reactor systems for Naval propulsion application.

m. Current and Pending Support. There are no other proposals for work which is the same or similar to that proposed herein that have previously been funded or are pending, or about to be submitted to another Federal agency or NRC.

n. Pre-existing Relevant Patents and Inventions. The proposed research is unrelated to any pre-existing patents or patent applications, owned or controlled by Gamma or others.

o. Budget. See attached Form SF 1411.

p. Current Research Commitments. If awarded, this research project will occur between October 1989 and April 1990. Most other projects currently committed by Gamma, and the principal investigator in particular, will be completed by that time. At the current time, the principal investigator is committed to a maximum of three (3) days per month during the period October 1989 through April 1990. This leaves ample time for the proposed research project.

q. Curriculum Vitae.

1. Principal Investigator - Herbert Feinroth

Education:

B.S., Chemical Engineering, University of Pennsylvania, 1957.
Bettis School of Reactor Engineering, 1960.
Federal Executive Institute, 1974.

Experience

Gamma Engineering Corporation (September 1984 - Present) - Founder and president of Gamma Engineering Corporation. Provides engineering and management consulting services to industry and government. Served as project manager and principal author of Atomic Industrial Forum study of regulatory aspects of nuclear plant life extension. Consults on the development and use of sophisticated electro-mechanical tooling for repairing nuclear power plant components, and on the development of advanced reactor designs and fuel transportation systems. Assisted in formulating and conducting senior engineering management training program to improve the quality of engineering at large industrial firm. Principal consultant to the Scientific Secretary of the Nuclear Energy Agency of the Organization of Economic Cooperation and Development for a thirteen nation study of "Advanced Water Reactor Technologies."

Gencon, Inc. (September 1982 - September 1984) - Founder and President of Gencon, Inc., of Germantown, MD. Managed and conducted technical evaluations for industrial and government clients dealing with nuclear plant quality assurance programs, servicing and repair of nuclear and fossil plant hardware, the Liquid Metal Fast Breeder Reactor base program facility needs, and new approaches for shipping the damaged fuel from Three Mile Island.

Department of Energy (DOE) and Energy Research and Development Administration (ERDA) (1976-1982) - In the Office of Nuclear Energy, DOE and ERDA, served as Assistant Director for Liquid Metal Fast Breeder Reactor (LMFBR) Technology and later as Deputy Director of the office handling space nuclear power and the Three Mile Island (TMI) program. Directed and managed ERDA's sodium breeder development programs in the fields of nuclear fuel, reactor physics, materials, chemistry, core design, and fuel fabrication.

Served as technical advisor to DOE management regarding the causes and implications of the TMI accident. Assisted the staff of the

Kemeny Commission investigating the accident and assisted the Carter Administration in developing follow-up actions to the Kemeny recommendations. Initiated a new DOE program to learn from the accident by conducting on-site examinations, established a cooperative program among DOE, Electric Power Research Institute (EPRI), Nuclear Regulatory Commission (NRC), and General Public Utilities (GPU) to conduct this program at TMI, negotiated an agreement with the Institute for Nuclear Power Operations (INPO) to conduct joint programs with DOE and implemented joint programs with the Commonwealth of Pennsylvania to allow independent radiation monitoring by the citizens near Three Mile Island.

Federal Energy Administration (FEA) (1974-1976) - Director of the Power Plants Division, and later Associate Director in the Office of Nuclear Affairs. Served as a technical advisor on Price Anderson and uranium enrichment legislation being sponsored by the FEA and initiated actions on fuel reprocessing, waste disposal, and uranium production aimed at removing constraints to the further expansion of nuclear power. Sponsored new programs to assist in improving the availability of existing coal and nuclear plants.

U.S. Atomic Energy Commission (AEC) (Breeder Reactor Development) (1972-1974) - In 1972, joined the AEC's Division of Reactor Development as Chief of the Facilities Branch. Managed programs to develop and test components for the LMFBR program, including test facilities for sodium pumps and steam generators. Supervised the efforts of AEC contractors and architect engineers involved in the design, fabrication, installation of test of these first of a kind test facilities.

U.S. Atomic Energy Commission (Naval Reactors) (1957-1971) - In the Naval Reactors Program served as an engineer assigned to the start up and first refueling of the Shippingport Atomic Power Station, and subsequently as senior staff assistant for core manufacture and production of pressure vessels and steam generators. Directed the procurement, manufacture, and quality control of production cores for surface ships and submarines. Served as full-time trouble shooter to solve the manufacturing problems that were delaying delivery for major components to Naval ships. Senior project manager for the development of the reactor core design for the U.S.S. Nimitz class aircraft carriers. Led a special "Heavy Pressure Vessel Forging" task force to advance the state of

the art for producing high strength steel forgings for reactor plant applications. Project Manager for development of a new, ceramic wafer-type fuel and core design for the second core of the Shippingport Atomic Power Station.

Publications and Speeches (examples)

1. Principal Author - AIF/NESP Report - "Regulatory Considerations for Extending the Life of Nuclear Power Plants" - Dec. 1986.
 2. Author - "The TMI-2 Accident and Recovery - A Retrospective Analysis" - Joint Meeting of American and Israel Nuclear Societies - Technion, Haifa, Israel on Dec. 20, 1983.
 3. Co-Author (with A.T. Barrata and G.E. Robinson) - "Design Approaches for the Next Generation of Light Water Reactors" - Joint Meeting of American & Israel Nuclear Societies - Haifa, Israel - Dec. 20, 1983.
 4. Co-Author (with F. Coffman) - "Three Mile Island - the Challenge, the Saga, the Outlook" - Lecture delivered by H. Feinroth to the British Nuclear Energy Society in London, Sept. 16, 1982; published in Nuclear Energy, 1982, Vol. 21, Dec. No. 6, 365-369.
 5. Author - "The Three Mile Island Accident - Its Challenge to the Engineering Profession" - American Society of Mechanical Engineers - Dec. 4, 1979.
2. Consultant - Dr. Samuel H. Levine

Full time Professor of Nuclear Engineering, Pennsylvania State University.

Education

B.S., Physics, Virginia Polytechnic Institute, 1947.
M.S., Physics, University of Illinois, 1948.
Ph.D., Physics, University of Pittsburgh, 1954.

Number of Years this Faculty: 20 years.

Date of Appointment: August, 1968 - Professor
1968-1986 - Director of Breazeale
Nuclear Reactor

Related Experience:

1986 - Present
University of Chicago
Review Committee for
the Experimental
Breeder Reactor - II. Chairman of Committee - 1987-1988
This committee reviews the operation
plans for the EBR-II for the University
of Chicago.

1968-1986 Director, Penn State Breazeale Nuclear
Reactor

1962-1968 Head, (Nuclear Science Laboratory,
Northrop Space Laboratories)

1961-1962 Head, Physics Group for Electrical
Propulsion, (Rocketdyne Division of
North American Aviation)

1959-1961 Reactor Physicist, (General Atomic
Division of General Dynamics (now Gulf
General Atomic)

1954-1959 Manager, Reactor Physicist and
Engineer, (Westinghouse Bettis Atomic
Power Division)

1943-1945 Aviation Cadet, (U.S. Air Force)

Biographical Listings: Who's Who in Technology, Who's Who in
Technology Today, Who's Who in
Education, Who's Who in Society, Who's
Who in Frontiers of Science and
Technology.

Society Memberships:

American Nuclear Society
American Physical Society
American Society of Testing Materials (ASTM)
Phi Kappa Phi (Honorary Society)
Sigma Xi (Honorary Society)

Honors and Awards:

NASA Invention Award (1973)
1953-1954 Westinghouse Fellowship
Lady Davis Fellowship Award by the Technion in Israel (1976-1977)

Publications and Speeches (examples)

1. D. H. Ahn, and S. H. Levine, "Automatic Optimized Reload and Depletion Method for a Pressurized Water Reactor," Nuc. Tech., Vol 71, p. 535, (Dec. 1985).
2. S. H. Levine, Chapter "In-Core Fuel Management of Four Reactor Types," CRC Handbook of Nuclear Reactor Calculations, Vol. 2, Editor Ronen (1986).
3. M. J. Cenko, M. A. Mann, S. H. Levine, E. C. Tourigny and W. F. Witzig, "Fuel Management Study of Three Mile Island Unit I," Trans. Am. Nucl. Soc. (1974).
4. M. J. Cenko, S. H. Levine and W. F. Witzig, "A High-Speed In-Core Fuel Management System for PWR's," Trans. Am. Nucl. Soc., Vol 21, p. 474 (1977).
5. A. A. Gui and S. H. Levine, "A UO₂ Fuel Element Design for Use in the Penn State Breazeale Reactor (PSBR)," Trans. Am. Nucl. Soc., Vol. 35 (1980).
6. D. Chang and S. H. Levine, "Optimization of the Fuel Depletion Trajectories for PWR's," Proceedings of the ANS Topical Meeting on Advances in Reactor Computation, Salt Lake City, Utah, Vol. 1, p. 285, March 28-30, 1983.
7. H. C. Kim, M. -Y. Hsiao, and S. H. Levine, "Minimal Cost Reload Method for Boiling Water Reactors Using the HUDDLE Code," Trans. Am. Nuc. Soc., Vol. 56, p. 93, June (1988).

PART 20-1 -- GENERAL

Subpart 20-1.54--Contractor Organizational Conflicts of Interest

Sec.	
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AUTHORITY: Sec. 8, Pub. L. 95-601, adding Sec. 170A to Pub. L. 83-703, 68 Stat. 919, as amended (42 U.S.C. ch. 14)

§20-1.5401 Scope and Policy

(a) It is the policy of the U.S. Nuclear Regulatory Commission (NRC) to avoid, eliminate or neutralize contractor organizational conflicts of interest. The NRC achieves this objective by requiring all prospective contractors to submit information describing relationships, if any, with organizations or persons (including those regulated by NRC) which may give rise to actual or potential conflicts of interest in the event of contract award.

(b) Contractor conflict of interest determinations cannot be made automatically or routinely; the application of sound judgment on virtually a case-by-case basis is necessary if the policy is to be applied so as to satisfy the overall public interest. It is not possible to prescribe in advance a specific method or set of criteria which would serve to identify and resolve all of the contractor conflict of interest situations which might arise; however, examples are provided in these regulations to guide application of the policy. NRC contracting and program officials must be alert to other situations which may warrant application of this policy guidance. The ultimate test is: Might the contractor, if awarded the contract, be placed in a position where its judgment may be biased, or where it may have an unfair competitive advantage?

(c) The conflict of interest rule contained in this subpart applies to contractors and offerors only. Individuals or firms who have other relationships with NRC (e.g., parties to a licensing proceeding) are not covered by this regulation. This rule does not apply to the acquisition of consulting services through the personnel appointment process, NRC

agreements with other government agencies, international organizations, or state, local or foreign governments; separate procedures for avoiding conflicts of interest will be employed in such agreements, as appropriate.

20-1.5402 Definitions

(a) "Organizational conflicts of interest" means that a relationship exists whereby a contractor or prospective contractor has present or planned interests related to the work to be performed under an NRC contract which: (1) May diminish its capacity to give impartial, technically sound, objective assistance and advice or may otherwise result in a biased work product, or (2) may result in its being given an unfair competitive advantage.

(b) "Research" means any scientific or technical work involving theoretical analysis, exploration, or experimentation.

(c) "Evaluation activities" means any effort involving the appraisal of a technology, process, product, or policy.

(d) "Technical consulting and management support services" means internal assistance to a component of the NRC in the formulation or administration of its programs, projects, or policies which normally require the contractor to be given access to information which has not been made available to the public or proprietary information. Such services typically include assistance in the preparation of program plans; and preparation of preliminary designs, specifications, or statements of work.

(e) "Contract" means any contract, agreement, or other arrangement with the NRC except as provided in Section 20-1.5401(c).

(f) "Contractor" means any person, firm, unincorporated association, joint venture, co-sponsor, partnership, corporation, affiliates thereof, or their successors in interest, including their chief executives, directors, key personnel (identified in the contract), proposed consultants or subcontractors, which is a party to a contract with the NRC.

(g) "Affiliates" means business concerns which are affiliates of each other when either directly or indirectly one concern or individual controls or has the power to control another, or when a third party controls or has the power to control both (41 CFR §1-1.506-1(e)).

(h) "Subcontractor" means any subcontractor of any tier which performs work under a contract with the NRC except subcontracts for supplies and subcontracts in amounts of \$10,000 or less. |

(i) "Prospective contractor" or "offeror" means any person, firm, unincorporated association, joint venture, partnership, corporation, or affiliates thereof, including its chief executive, directors, key personnel (identified in the proposal), proposed consultants, or subcontractors, submitting a bid or proposal, solicited or unsolicited, to the NRC to obtain a contract.

(j) "Potential conflict of interest" means that a factual situation exists that suggests (indicates) that an actual conflict of interest may arise from award of a proposed contract. The term "potential conflict of interest" is used to signify those situations which merit investigation prior to contract award in order to ascertain whether award would give rise to an actual conflict or which must be reported to the contracting officer for investigation if they arise during contract performance.

§ 20-1.5403 Criteria for recognizing contractor organizational conflicts of interest

(a) General. Two questions will be asked in determining whether actual or potential organizational conflicts of interest exist: (1) Are there conflicting roles which might bias a contractor's judgment in relation to its work for the NRC? (2) May the contractor be given an unfair competitive advantage based on the performance of the contract? The ultimate determination by NRC as to whether organizational conflicts of interest exist will be made in light of common sense and good business judgment based upon the relevant facts disclosed and the work to be performed. While it is difficult to identify and to prescribe in advance a specific method for avoiding all of the various situations or relationships which might involve potential organizational conflicts of interest, NRC personnel will pay particular attention to proposed contractual requirements which call for the rendering of advice, consultation or evaluation activities, or similar activities that lay direct groundwork for the NRC's decisions on regulatory activities, future procurements, and research programs.

(b) Situations or relationships which may give rise to organizational conflicts of interest. (1) The offeror or contractor shall disclose information concerning relationships which may give rise to organizational conflicts of interest under the following circumstances:

(i) Where the offeror or contractor provides advice and recommendations to the NRC in a technical area in which it is also providing consulting assistance in the same area to any organization regulated by the NRC.

(ii) Where the offeror or contractor provides advice to the NRC on the same or similar matter in which it is also providing assistance to any organization regulated by the NRC.

(iii) Where the offeror or contractor evaluates its own products or services, or the products or services of another entity where the offeror or contractor has been substantially involved in their development or marketing.

(iv) Where the award of a contract would otherwise result in placing the offeror or contractor in a conflicting role in which its judgment may be biased in relation to its work for the NRC or may otherwise result in an unfair competitive advantage for the offeror or contractor.

(2) The contracting officer may request specific information from an offeror or contractor or may require special contract provisions such as provided in 120-1.5405-2 in the following circumstances:

(i) Where the offeror or contractor prepares specifications which are to be used in competitive procurements of products or services covered by such specifications.

(ii) Where the offeror or contractor prepares plans for specific approaches or methodologies that are to be incorporated into competitive procurements using such approaches or methodologies.

(iii) Where the offeror or contractor is granted access to information not available to the public concerning NRC plans, policies, or programs which could form the basis for a later procurement action.

(iv) Where the offeror or contractor is granted access to proprietary information of its competitors.

(v) Where the award of a contract might otherwise result in placing the offeror or contractor in a conflicting role in which its judgment may be biased in relation to its work for the NRC or may otherwise result in an unfair competitive advantage for the offeror or contractor.

(c) Policy application guidance. The following examples are illustrative only and are not intended to identify and resolve all contractor organizational conflict of interest situations. (1) Example. The XYZ Corp., in response to a request for proposal (RFP), proposes to undertake certain analyses of a reactor component as called for in the RFP. The XYZ Corp. is one of several companies considered to be technically well qualified. In response to the inquiry in the RFP, the XYZ Corp. advises that it is currently performing similar analyses for the reactor manufacturer.

Guidance. An NRC contract for that particular work normally would not be awarded to the XYZ Corp. because it would be placed in a position in which its judgment could be biased in relationship to its work for NRC. Since there are other well-qualified companies available, there would be no reason for considering a waiver of the policy.

(2) Example. The ABC Corp., in response to a RFP, proposes to perform certain analyses of a reactor component which are unique to one type of advanced reactor. As is the case with other technically qualified companies responding to the RFP, the ABC Corp. is performing various projects for several different utility clients. None of the ABC Corp. projects have any relationship to the work called for in the RFP. Based on the NRC evaluation, the ABC Corp. is considered to be the best qualified company to perform the work outlined in the RFP.

Guidance. An NRC contract normally could be awarded to the ABC Corp. because no conflict of interest exists which would motivate bias with respect to the work. An appropriate clause would be included in the contract to preclude the ABC Corp. from subsequently contracting for work during the performance of the NRC contract with the private sector which could create a conflict. For example, ABC Corp. would be precluded from the performance of similar work for the company developing the advanced reactor mentioned in the example.

(3) Example. As a result of operating problems in a certain type of commercial nuclear facility, it is imperative that NRC secure specific data on various operational aspects of that type of plant so as to assure adequate safety protection of the public. Only one manufacturer has extensive experience with that type of plant. Consequently, that company is the only one with whom NRC can contract which can develop and conduct the testing programs required to obtain the data in reasonable time. That company has a definite interest in any NRC decisions that might result from the data produced because those decisions affect the reactor's design and thus the company's costs.

Guidance. This situation would place the manufacturer in a role in which its judgment could be biased in relationship to its work for NRC. Since the nature of the work required is vitally important in terms of NRC's responsibilities and no reasonable alternative exists, a waiver of the policy may be warranted. Any such waiver shall be fully documented and coordinated in accordance with the waiver provisions of this policy with particular attention to the establishment of protective mechanisms to guard against bias.

(4) Example. The ABC Co. submits a proposal for a new system for evaluating a specific reactor component's performance for the purpose of developing standards that are important to the NRC program. The ABC Co. has advised NRC that it intends to sell the new system to industry once its practicability has been demonstrated. Other companies in this business are using older systems for evaluation of the specific reactor component.

Guidance. A contract could be awarded to the ABC Co. provided that the contract stipulates that no information produced under the contract will be used in the contractor's private activities unless such information has been reported to NRC. Information which is reported to NRC by contractors will normally be disseminated by NRC to others so as to preclude an unfair competitive advantage that might otherwise accrue. When NRC furnishes information to the contractor for the performance of contract work, it shall not be used in the contractor's private activities unless such information is generally available to others. Further, the contract will stipulate that the contractor will inform the NRC contracting officer of all situations in which the information developed under the contract is proposed to be used.

(5) Example. The ABC Corp., in response to a RFP proposes to assemble a map showing certain seismological features of the Appalachian fold belt. In accordance with the representation in the RFP and §20-1.5403(b)(1)(i), ABC Corp. informs the NRC that it is presently doing seismological studies for several utilities in the Eastern United States but none of the sites are within the geographic area contemplated by the NRC study.

Guidance. The contracting officer would normally conclude that award of a contract would not place ABC Corp. in a conflicting role where its judgment might be biased. The work for others clause of §20-1.5405-1(c) would preclude ABC Corp. from accepting work during the term of the NRC contract which could create a conflict of interest.

(d) Other considerations. (1) The fact that the NRC can identify and later avoid, eliminate, or neutralize any potential organizational conflicts arising from the performance of a contract is not relevant to a determination of the existence of such conflicts prior to the award of a contract.

(2) It is not relevant that the contractor has the professional reputation of being able to resist temptations which arise from organizational conflicts of interest, or that a follow-on procurement is not involved, or that a contract is awarded on a competitive or a sole source basis.

§20-1.5404 Representation

(a) The following procedures are designed to assist the NRC contracting officer in determining whether situations or relationships exist which may constitute organizational conflicts of interest with respect to a particular offeror or contractor.

(b) Representation procedure. The following organizational conflicts of interest representation provision shall be included in all solicitations and unsolicited proposals for: (1) Evaluation services or activities; (2) technical consulting and management support services; (3) research; and (4) other contractual situations where special organizational conflicts of interest provisions are noted in the solicitation and would be included in the resulting contract. This representation requirement shall also apply to all modifications for additional effort under the contract except those issued under the "changes" clause. Where, however, a statement of the type required by the organizational conflicts of interest representation provision has previously been submitted with regard to the contract being modified, only an updating of such statement shall be required.

ORGANIZATIONAL CONFLICTS OF INTEREST REPRESENTATION

I represent to the best of my knowledge and belief that:

The award to _____ of a contract or the modification of an existing contract does () or does not () involve situations or relationships of the type set forth in 41 CFR §20-1.5403(b)(1).

(c) Instructions to offerors. The following shall be included in all NRC solicitations: (1) If the representation as completed indicates that situations or relationships of the type set forth in 41 CFR §20-1.5403(b)(1) are involved, or the contracting officer otherwise determines that potential organizational conflicts exist, the offeror shall provide a statement in writing which describes in a concise manner all relevant facts bearing on his representation to the contracting officer. If the contracting officer determines that organizational conflicts exist, the following actions may be taken: (i) Impose appropriate conditions which avoid such conflicts, (ii) disqualify the offeror, or (iii) determine that it is otherwise in the best interest of the United States to seek award of the contract under the waiver provisions of §20-1.5411.

(2) The refusal to provide the representation required by §20-1.5404(b) or upon request of the contracting officer the facts required by §20-1.5404(c), shall result in disqualification of the offeror for award. The nondisclosure or misrepresentation of any relevant interest may also result in the disqualification of the offeror for award; or if such nondisclosure or misrepresentation is discovered after award, the resulting contract may be terminated. The offeror may also be disqualified from subsequent related NRC contracts and be subject to such other remedial actions provided by law or the resulting contract.

(d) The offeror may, because of actual or potential organizational conflicts of interest, propose to exclude specific kinds of work from the statements of work contained in a RFP unless the RFP specifically prohibits such exclusion. Any such proposed exclusion by an offeror will be considered by the NRC in the evaluation of proposals. If the NRC considers the proposed excluded work to be an essential or integral part of the required work and its exclusion would work to the detriment of the competitive posture of the other offerors, the proposal must be rejected as unacceptable.

(e) The offeror's failure to execute the representation required by subsection (b) above with respect to invitation for bids will be considered to be a minor informality, and the offeror will be permitted to correct the omission.

§ 20-1.5405 Contract clauses

§ 20-1.5405-1 General contract clause

All contracts of the types set forth in §20-1.5404(b) shall include the following clauses:

(a) Purpose. The primary purpose of this clause is to aid in ensuring that the contractor: (1) is not placed in a conflicting role because of current or planned interest (financial, contractual, organizational, or otherwise) which relate to the work under this contract, and (2) does not obtain an unfair competitive advantage over other parties by virtue of its performance of this contract.

(b) Scope. The restrictions described herein shall apply to performance or participation by the contractor as defined in 41 CFR §20-1.5402(f) in the activities covered by this clause.

(c) Work for others. Notwithstanding any other provision of this contract, during the term of this contract, the contractor agrees to forego entering into consulting or other contractual arrangements with any firm or organization, the result of which may give rise to a conflict of interest with respect to the work being performed under this contract. The contractor shall ensure that all employees who are employed full time under this contract and employees designated as key personnel, if any, under this contract abide by the provision of this clause. If the contractor believes with respect to itself or any such employee that any proposed consultant or other contractual arrangement with any firm or organization may involve a potential conflict of interest, the contractor shall obtain the written approval of the contracting officer prior to execution of such contractual arrangement.

(d) Disclosure after award. (1) The contractor warrants that to the best of its knowledge and belief and except as otherwise set forth in this contract, it does not have any organizational conflicts of interest, as defined in 41 CFR §20-1.5402(a).

(2) The contractor agrees that if after award it discovers organizational conflicts of interest with respect to this contract, it shall make an immediate and full disclosure in writing to the contracting officer. This statement shall include a description of the action which the contractor has taken or proposes to take to avoid or mitigate such conflicts. The NRC may, however, terminate the contract for convenience if it deems such termination to be in the best interests of the government.

(e) Access to and use of information. (1) If the contractor in the performance of this contract obtains access to information, such as NRC plans, policies, reports, studies, financial plans, internal data protected by the Privacy Act of 1974 (Pub. L. 93-579), or data which has not been released to the public, the contractor agrees not to: (1) Use such information for any private purpose until the information has been released to the public; (11) compete for work for the Commission based

on such information for a period of six (6) months after either the completion of this contract or the release of such information to the public, whichever is first, (iii) submit an unsolicited proposal to the government based on such information until one year after the release of such information to the public, or (iv) release the information without prior written approval by the contracting officer unless such information has previously been released to the public by the NRC.

(2) In addition, the contractor agrees that to the extent it receives or is given access to proprietary data, data protected by the Privacy Act of 1974 (Pub. L. 93-579), or other confidential or privileged technical, business, or financial information under this contract, the contractor shall treat such information in accordance with restrictions placed on use of the information.

(3) The contractor shall have, subject to patent and security provisions of this contract, the right to use technical data it produces under this contract for private purposes provided that all requirements of this contract have been met.

(f) Subcontracts. Except as provided in 41 CFR §20-1.5402(h), the contractor shall include this clause, including this paragraph, in subcontracts of any tier. The terms "contract," "contractor," and "contracting officer," shall be appropriately modified to preserve the government's rights.

(g) Remedies. For breach of any of the above proscriptions or for intentional nondisclosure or misrepresentation of any relevant interest required to be disclosed concerning this contract or for such erroneous representations as necessarily imply bad faith, the government may terminate the contract for default, disqualify the contractor from subsequent contractual efforts, and pursue other remedies as may be permitted by law or this contract.

(h) Waiver. A request for waiver under this clause shall be directed in writing through the contracting officer to the Executive Director for Operations (EDO) in accordance with the procedures outlined in §20-1.5411.

§20-1.5405-2 Special contract provisions.

(a) If it is determined from the nature of the proposed contract that organizational conflicts of interest exist, the contracting officer may determine that such conflict can be avoided or after obtaining a waiver in accordance with §20-1.5411, neutralized through the use of an appropriate special contract provision. If appropriate, the offeror may negotiate the terms and conditions of these clauses, including the extent and time period of any such restriction. These provisions include but are not limited to:

(1) Hardware exclusion clauses which prohibit the acceptance of production contracts following a related nonproduction contract previously performed by the contractor;

(2) Software exclusion clauses;

(3) Clauses which require the contractor (and certain of his key personnel) to avoid certain organizational conflicts of interest; and

(4) Clauses which provide for protection of confidential data and guard against its unauthorized use.

(b) The following additional contract clause may be included as section (i) in the clause set forth in § 20-1.5405-1 when it is determined that award of a follow-on contract would constitute an organizational conflict of interest.

(i) Follow-on effort. (1) The contractor shall be ineligible to participate in NRC contracts, subcontracts, or proposals therefor (solicited or unsolicited) which stem directly from the contractor's performance of work under this contract. Furthermore, unless so directed in writing by the contracting officer, the contractor shall not perform any technical consulting or management support services work or evaluation activities under this contract on any of its products or services or the products or services of another firm if the contractor has been substantially involved in the development or marketing of such products or services.

(2) If the contractor under this contract prepares a complete or essentially complete statement of work or specifications, the contractor shall be ineligible to perform or participate in the initial contractual effort which is based on such statement of work or specifications. The contractor shall not incorporate its products or services in such statement of work or specifications unless so directed in writing by the contracting officer, in which case the restriction in this subparagraph shall not apply.

(3) Nothing in this paragraph shall preclude the contractor from offering or selling its standard commercial items to the government.

§ 20-1.5406 Evaluation, findings, and contract award

The contracting officer will evaluate all relevant facts submitted by an offeror pursuant to the representation requirements of § 20-1.5404(b) and other relevant information. After evaluating this information against the criteria of § 20-1.5403, a finding will be made by the contracting officer whether organizational conflicts of interest exist with respect to a particular offeror. If it has been determined that conflicts of interest exist, then the contracting officer shall either:

(a) Disqualify the offeror from award,

(b) Avoid or eliminate such conflicts by appropriate measures; or

(c) Award the contract under the waiver provision of §20-1.5411.

§20-1.5407 Conflicts identified after award.

If potential organizational conflicts of interest are identified after award with respect to a particular contractor, the contracting officer determines that such conflicts do, in fact, exist and that it would not be in the best interests of the government to terminate the contract as provided in the clauses required by §20-1.5405, the contracting officer will take every reasonable action to avoid, eliminate, or, after obtaining a waiver in accordance with §20-1.5411, neutralize the effects of the identified conflict.

§20-1.5408 (Reserved)

§20-1.5409 (Reserved)

§20-1.5410 Subcontracts

The contracting officer shall require offerors and contractors to submit a representation statement in accordance with §20-1.5404(b) from subcontractors and consultants. The contracting officer shall require the contractor to include contract clauses in accordance with §20-1.5405 in consultant agreements or subcontracts involving performance of work under a prime contract covered by this subsection.

§20-1.5411 Waiver

In the first instance, determination with respect to the need to seek a waiver for specific contract awards shall be made by the contracting officer with the advice and concurrence of the program office director and the Office of Executive Legal Director. Upon the recommendation of the contracting officer, and after consultation with the Office of the General Counsel, the EDO may waive the policy in specific cases if he determines that it is in the best interest of the United States to do so.

Such action shall be strictly limited to those situations in which:


- (1) The work to be performed under contract is vital to the NRC program;
- (2) the work cannot be satisfactorily performed except by a contractor whose interests give rise to a question of conflict of interest; and
- (3) contractual and/or technical review and supervision methods can be employed by NRC to neutralize the conflict. For any such waivers, the justification and approval documents shall be placed in the Public Document Room.

§20-1.5412 Remedies

In addition to such other remedies as may be permitted by law or contract for a breach of the restrictions in this subpart or for any intentional misrepresentation or intentional nondisclosure of any relevant interest required to be provided for this section, the NRC may debar the contractor from subsequent NRC contracts.

Dated at Washington, D.C. this 27th day of March 1979.

For the Nuclear Regulatory Commission



Samuel J. Chilk
Secretary of the Commission

BILLING INSTRUCTIONS FOR
FIXED PRICE CONTRACTS

General: The contractor shall prepare vouchers or invoices as prescribed herein. FAILURE TO SUBMIT VOUCHERS/INVOICES IN ACCORDANCE WITH THESE INSTRUCTIONS WILL RESULT IN REJECTION OF THE VOUCHER/INVOICE AS IMPROPER.

Form: Claims shall be submitted on the payee's letterhead, voucher/invoice, or on the Government's Standard Form 1034, "Public Voucher for Purchases and Services Other than Personal," and Standard Form 1035, "Public Voucher for Purchases Other than Personal--Continuation Sheet." These forms are available from the U. S. Government Printing Office, 701 North Capitol Street, Washington, D.C. 20801.

Number of Copies: An original and three copies shall be submitted. Failure to submit all the required copies will result in rejection of the voucher/invoice as improper.

Designated Agency Billing Office: Vouchers/invoices shall be submitted to the following address:

U. S. Nuclear Regulatory Commission
Division of Contracts and Property Management
Contract Administration Branch, Mailstop P-902
Washington, D.C. 20555

HAND-DELIVERY OF VOUCHERS/INVOICES IS DISCOURAGED AND WILL NOT EXPEDITE PROCESSING BY NRC. However, should you choose to deliver vouchers/invoices by hand, including delivery by any express mail services or special delivery services which use a courier or other person to deliver the voucher/invoice in person to the NRC, such vouchers/invoices must be addressed to the above Designated Agency Billing Office and will only be accepted at the following location:

U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Room
Rockville, Maryland 20852

HAND-CARRIED SUBMISSIONS WILL NOT BE ACCEPTED AT OTHER THAN THE ABOVE ADDRESS.

Note that the official receipt date for hand-delivered vouchers/invoices will be the date it is received by the official agency billing office in the Division of Contracts and Property Management.

Agency Payment Office: Payment will continue to be made by the office designated in the contract in Block 13 of SF 26 or Block 25 of SF 33, whichever is applicable.

Frequency: The contractor shall submit an voucher or invoice only after NRC's final acceptance of services rendered or products delivered in performance of the contract unless otherwise specified in the contract.

Preparation and Itemization of the Voucher/Invoice: The voucher/invoice shall be prepared in ink or by typewriter (without strikeovers). Corrections or erasures must be initialed. To be considered a proper voucher/invoice, all of the following elements must be included:

1. Contract number
2. Sequential voucher/invoice number.
3. Date of voucher/invoice.
4. Project Officer's name and mailstop as designated in the contract.
5. Payee's name and address. (Show the name of the contractor and its correct address. In addition, when an assignment of funds has been made by the contractor, or a different payee has been designated, include the name and address of the payee.) Indicate the name and telephone number of the individual responsible for answering questions the NRC may have regarding the voucher/invoice.
6. Description of articles or services, quantity, unit price, and total amount.
7. Weight and zone of shipment, if shipped by parcel post.
8. Charges for freight or express shipments. Attach prepaid bill if shipped by freight or express.
9. Instructions to consignee to notify the Contracting Officer of receipt of shipment.
10. For Indefinite Delivery contracts or contracts under which progress payments are authorized, the final voucher/invoice shall be marked "FINAL VOUCHER" or "FINAL INVOICE."

Currency: Billings may be expressed in the currency normally used by the contractor in maintaining his accounting records and payments will be made in that currency. However, the U. S. dollar equivalent for all vouchers/invoices paid under the contract may not exceed the total U. S. dollars authorized in the contract.

Supersession: These instructions supersede any previous billing instructions.

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TRANSMITTAL NOTICE

CHAPTER NRC-3202 PUBLICATION OF TECHNICAL REPORTS PREPARED BY NRC CONTRACTORS, INCLUDING REPORTS PREPARED UNDER OR PURSUANT TO INTERAGENCY AGREEMENTS

SUPERSEDED:

	Number	Date
Chapter	<u>NRC-3202</u>	<u>4/29/82</u>
Page	<u> </u>	<u> </u>
	<u> </u>	<u> </u>
Appendix	<u>NRC-3202</u>	<u>4/29/82</u>

TRANSMITTED:

	Number	Date
TN	<u>3200-21</u>	
Chapter	<u>NRC-3202</u>	<u>8/29/84</u>
Page	<u> </u>	<u> </u>
	<u> </u>	<u> </u>
Appendix	<u>NRC-3202</u>	<u>8/29/84</u>

REMARKS:

This revision of Chapter 3202 expands the chapter from coverage of unclassified reports to include the marking and handling of sensitive unclassified information (Official Use Only and Limited Official Use Information, Safeguards Information, Proprietary Information) and classified information (Top Secret, Secret, and Confidential). A section has also been added to set forth procedures for the handling of unclassified reports on NRC cooperative programs with foreign governments and organizations and with U.S. industry.

U.S. NUCLEAR REGULATORY COMMISSION
NRC MANUAL

Volume: 3000 Information and Foreign Activities
Part : 3200 Technical Information and Document Control

ADM

CHAPTER 3202 PUBLICATION OF TECHNICAL REPORTS PREPARED BY
NRC CONTRACTORS, INCLUDING REPORTS PREPARED
UNDER OR PURSUANT TO INTERAGENCY AGREEMENTS

3202-01 COVERAGE

This chapter and its appendix handbook establish responsibilities, basic requirements, standards and procedures for the documentation, production and dissemination of technical reports prepared by NRC consultants and grantees and by NRC contractors and their subcontractors, including reports prepared under or pursuant to interagency agreements or memorandums of understanding. These reports are hereafter referred to as contractor reports. This chapter does not cover NRC staff-generated documents, NRC docket material, or the documents generated by NRC boards, panels, advisory committees and Offices that report to the Commission.

3203-02 OBJECTIVES

021 to assure production and dissemination of technical reports as required by the Energy Reorganization Act of 1974 and the Freedom of Information Act.

022 to assure that dissemination of technical reports is consistent with requirements for public availability of information.

023 to assure that national security, patent rights, copyrights, proprietary rights and rights in other sensitive unclassified information are not compromised by the release, distribution, or dissemination of technical reports from NRC.

024 to assure that formal NRC contractor reports will carry the registered NRC designation NUREG/CR or NUREG/CP as the prime identification.

025 to provide for coordination of press or other media releases.

3202-03 RESPONSIBILITIES AND AUTHORITIES

031 The Director, Office of Administration:

- a. develops and maintains, in consultation with Directors of Offices and Divisions and Regional Administrators, NRC standards, procedures and guides for the production and dissemination of technical contractor reports.

Approved: August 29, 1984

- b. periodically surveys report activities throughout NRC to ascertain that the provisions of this chapter are adequate and are being implemented; makes any changes needed.

032 The Director, Division of Technical Information and Document Control:

- a. develops and administers a central report control system for identifying, printing and distributing contractor reports and responding to requests for unclassified reports.
- b. develops and maintains guides and standards for the documentation, formatting, printing, dissemination, and public sale of unclassified contractor reports.
- c. assures that a system exists for review of unclassified contractor reports for adherence to patent, copyright and disclosure policies prior to dissemination.
- d. establishes and administers interagency agreements necessary for the dissemination and public sale of unclassified contractor reports and controls duplication and printing of contractor reports to assure adherence to the Government Printing and Binding Regulations issued by the Joint Committee on Printing (JCP), Congress of the United States.
- e. in response to requests of Directors of Offices and Regional Administrators, establishes distribution data banks, maintains official standard distribution lists for automatic distribution of unclassified contractor reports, and controls distribution to assure adherence to the Government Printing and Binding Regulations, the Privacy Act, and the Freedom of Information Act.

033 Directors of Offices and Regional Administrators:

- a. establish the contract or Standard Order for Work* provisions, including those required by this chapter and its appendix; Chapter NRC-3203, Distribution of Unclassified NRC Staff- and Contractor-Generated Documents and its appendix; Chapter NRC-0260, Printing, Copying, Graphics and Photography and its appendix; and Chapter NRC-1102, Procedures for Placement of Work with the Department of Energy. In the Statement of Work:
 - (1) specify what reports will be reviewed for policy, management, and legal issues by NRC staff in draft prior to printing and distribution. If the report is to be reviewed by NRC staff, give the conditions under which the contractor may publish documents in the event of unresolvable differences relative to the draft, including the type of disclaimer to be used in addition to the standard government disclaimer (see Exhibit 6).

* In the case of DOE work, this is NRC Form 173, Standard Order for DOE Work. See Chapter NRC-1102

PUBLICATION OF TECHNICAL REPORTS PREPARED BY
NRC CONTRACTORS, INCLUDING REPORTS PREPARED
UNDER OR PURSUANT TO INTERAGENCY AGREEMENTS

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- (2) provide for the reviews necessary to insure that the national security, patent rights, copyrights, proprietary rights and rights in other sensitive unclassified information are not compromised by the release or dissemination of the reports. If DOE contractors are to be authorized to make the reviews, designate the contractor officials who are authorized to sign NRC Form 426A prior to NRC distribution of reports (see Appendix, Part IV). Assure that sensitive unclassified and classified reports are marked and handled properly (see Appendix, Part V).
 - (3) specify that all formal reports carry NUREG/CR or NUREG/CP numbers as the prime identification, as illustrated in the appendix.
 - (4) specify whether formal reports shall be printed by NRC or the contractor if the contractor has a JCP-authorized federal printing plant (see Appendix, Parts II and IV).
 - (5) specify that all formal reports required by NRC shall be distributed by NRC.
 - (6) establish the number of copies the contractor may retain or request for internal and external distribution and charge against NRC. Written justification must be provided, and approval obtained of the NRC JCP representative (the Director, Division of Technical Information and Document Control) when the number exceeds the 50 copies authorized by JCP for unclassified reports.
 - (7) assure the protection of classified and sensitive unclassified information, if any, in contractor reports (see Appendix, Part V).
- b. assure adherence to instructions and authorizations regarding the reproduction and distribution of reports.
 - c. recommend standard distribution category(ies) for contractor reports to the Division of Technical Information and Document Control.
 - d. provide changes to the official standard distribution lists to the Division of Technical Information and Document Control.
 - e. establish procedures for review of contractor's proposed press and other media releases.

034 The Office of the Executive Legal Director provides legal review and advice to NRC staff on questions regarding inventions, patents, proprietary information, use of copyrighted material, national security, and other sensitive unclassified and classified information.

035 The Director, Office of Public Affairs, upon request of the project manager, reviews proposed contractor's press or other media releases for appropriateness.

Approved: August 29, 1984

036 The Director, Division of Security:

- a. administers the overall information security program which includes management of the security classification program and other programs for the protection of sensitive unclassified information.
- b. advises staff of NRC Offices and Regions on the preparation and handling of reports containing classified, proprietary and other sensitive unclassified information.

037 The Director, Division of Contracts:

- a. coordinates the flow of all reports to and from contractors (other than DOE contractors) where such reports may result in alterations in the terms and conditions of applicable contracts as they pertain to report production and distribution.
- b. advises the contractor as to the source and method for obtaining reports required from the government for performance of the contract.
- c. provides contractor with copies of NRC Chapters 0260, 3202, 3203, 3207, and 3210, when appropriate.
- d. determines when requests for proposals and invitations for bids, as well as subsequent contracts, should include statements requiring contractor compliance with Chapters NRC-3202, 3207, and 3210 and the Government Printing and Binding Regulations.
- e. ensures that appropriate clauses are included in contracts regarding the private use and protection of classified, proprietary and other sensitive unclassified information.

3202-04 DEFINITIONS*

041 camera-ready copy - pages ready for printing by the offset printing process. This is a colloquial term used even though the printing process may not involve the so-called copy camera (see also reproducible masters).

042 central report control system - means for developing and maintaining the policies, procedures and guides needed to identify and produce regulatory and technical reports and to assure adherence to requirements and standards for documentation, formatting, printing and distribution.

043 contractor report - record of work done (a report) prepared in accordance with the provisions of a contract or under or pursuant to an interagency agreement.

* Words underscored in definitions are also defined in list.

044 copyright - a form of protection provided by the laws of the United States (Title 17, U.S. Code) to the authors of "original works of authorship" including literary, dramatic, musical, artistic, and certain other intellectual works. This protection is available to both published and unpublished works. Copyrighted material may not be reproduced without the permission of the author or publisher.

045 disseminate - to announce the publication of reports and make them available for free distribution, sale or copying.

046 distribute - to dispense reports to specific organizations and individuals to assure their participation in the regulatory process and support of research and technological investigations. Such distribution may be accomplished by the use of standard distribution data banks established and maintained by the Division of Technical Information and Document Control based on the requests of the originating Office or Region.

047 documentation - classification and associated markings required for classified or sensitive unclassified documents, the NRC report number unique to the report, title (and subtitle, if any), author or correspondent (if any), organization identification and contract number (or FIN number), date and availability.

048 draft or final material for inclusion in "Safety Evaluation Reports" or "Environmental Statements" (ES) - written material requested for input to SERs or ESs to be issued as NUREGs. Such material may be edited or modified at the discretion of the NRC staff.

049 formal technical reports - the final product of research, an original investigation, or a significant compilation of information. This product is a formal technical report for publication in the NUREG/CR series. For extensive long-term projects, formal monthly, quarterly or semiannual and annual periodic technical reports may be required. A draft of the final or periodic report may be requested for comment prior to preparation of the camera-ready copy.

0410 NRC project manager - the NRC staff member responsible for the work performed by consultants or contractors and their subcontractors, or for work performed under or pursuant to an interagency agreement.

0411 patent review - examination by legal staff to assure protection rights in inventions.

0412 proprietary information - trade secrets; privileged or confidential research, development, commercial or financial information, exempt from mandatory disclosure under 10 CFR Part 2 (Sections 2.740 and 2.790) and under 10 CFR Part 9 (Section 9.5); and other information submitted in confidence to the NRC by a foreign source and determined to be unclassified by the NRC.

0413 publicly available documents - information (reports and references) which is available in the NRC Public Document Room (PDR) for public inspection and copying or available in the public domain.

0414 reproducible masters - camera-ready copy which includes (1) originals of line drawings (or prints that can be copied), (2) glossy prints of black and white photographs (colored photographs cannot be reproduced), (3) original typed or printed text, tables, cover, title page, contents and abstract, or (4) other forms of the materials listed in (1), (2) and (3) that a printer can reproduce.

0415 technical reports - information on the technical aspects of contract work. These may be interim or final technical letter reports, draft or final formal technical reports for publication in the NUREG/CR or NUREG/CP series, or draft or final material for inclusion in SERs or ESs.

0416 technical letter reports (also called technical evaluation reports) - interim or final letters that provide information on the technical aspects of contract work. Interim technical letter reports may be required at various stages of a project. These reports usually are followed by a final technical letter report or a formal technical report. Final technical letter reports are usually specified in situations where the technical work is review and evaluation of work of others or work to be used by the staff in the licensing and regulation process. Interim letter reports may include, but are not limited to, informal (interim) progress reports, quick-look reports, data reports, status summary reports, project descriptions, pre-tested predictions, model verifications, experiment safety analyses, experiment operating procedures, facility certification reports, and test result reports.

0417 unique identification - NRC identification used on a report and its attachments, revisions, and supplements that is not used on any other report.

3202-05 BASIC REQUIREMENTS

051 Applicability. The provisions of this chapter and its appendix apply to NRC consultants, grantees, contractors and subcontractors, including those working under interagency agreements, whose contracts require the preparation of technical reports. Because of the unique requirements of NRC boards, panels, advisory committees and Offices which report directly to the Commission, the handling of reports prepared by consultants and contractors to them are governed by the Board or Panel Chairman and, in the case of advisory committees, by the Advisory Committee Management Officer, or the Commission. These exceptions do not preclude the use of the NUREG/CR series designation on reports prepared for these entities that are to be given wide public dissemination.

052 Forms. NRC Form 426A, "Publication Release for Unclassified NRC Contractor and Consultant Reports" (Exhibit 5), NRC Form 335, "Bibliographic Data Sheet" (Exhibit 7), and NRC Form 190, "Cover Sheet for Reports Containing Proprietary Information" (Exhibit 19), shall be used as provided in the appendix.

053 Appendix 3202. This appendix contains standards and procedures for the preparation of reporting requirement portions of Statements of Work, and for the documentation, production, and dissemination of technical reports prepared by contractors and other government agencies in accordance with contract requirements or interagency agreements.

054 Preparation Requirements

- a. Reports to be Printed by NRC. All contractor reports to be printed by NRC shall be prepared according to Appendix 3202. The reproducible masters for the requisite distribution shall be transmitted to the Division of Technical Information and Document Control accompanied by completed NRC Form 426A and NRC Form 335.
- b. Reports Printed by Authorized Federal Printing Plants. All contractor reports to be printed by the contractor (as specified by the contract, agreement, or standard order for work) shall be prepared according to Appendix 3202, and a reproducible master and sufficient copies for standard and incidental distribution shall be supplied to the Division of Technical Information and Document Control, accompanied by completed NRC Form 426A, signed by the authorized contractor official. Each such report shall include, as the last page, a completed NRC Form 335.

055 References. The NRC chapters referenced and NUREG-0794 (ref. j) and NUREG-0650 (ref. i) are available from the Division of Technical Information and Document Control. The other publications are available from the Government Printing Office.

- a. Chapter NRC-0260, "Printing, Copying, Graphics and Photography."
- b. Chapter and Appendix NRC-2101, "NRC Security Program."
- c. Chapter NRC-3203, "Distribution of Unclassified NRC Staff- and Contractor-Generated Documents."
- d. Chapter NRC-1102, "Procedures for Placement of Work with the Department of Energy."
- e. Chapter NRC-3206, "NRC Contractor Speeches, Papers and Journal Articles on Regulatory and Technical Subjects."
- f. Chapter NRC-3207, "Conferences and Conference Proceedings."
- g. Title 44, U.S. Code, "Public Printing and Documents," Government Printing Office.
- h. Government Printing and Binding Regulations of the Joint Committee on Printing, Congress of the United States, No. 24, April 1977 (JCP Regulations), Government Printing Office.
- i. Title 5, U.S. Code, "Government Organization and Employees," Government Printing Office.

- j. "Technical Writing Style Guide," A. W. Savolainen et al., compilers, U.S. NRC Report NUREG-0650, November 1979, and Supplement 1, February 1982.
- k. "Protection of Unclassified Safeguards Information," D. J. Kasun, USNRC Report NUREG-0794, October 1981.
- l. Chapter NRC-0255, "Mail Management," and Appendix 0255, Part V, Annex A.

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PART I

PREPARATION OF REPORTING REQUIREMENT PORTIONS OF STATEMENTS OF WORK FOR CONTRACTS, GRANTS AND STANDARD ORDERS FOR DOE WORK

A. LIST OF TECHNICAL REPORT REQUIREMENTS

List the technical reports required from each project, task or subtask, as applicable. State when and to whom they should be submitted and what they should contain. These reports may be unclassified, sensitive unclassified or classified. Standards for each of these categories are presented in Parts II through V. The following definitions describe the types of reports that may be specified:

technical reports - information on the technical aspects of contract work. These may be interim or final technical letter reports, draft or final formal technical reports for publication in the NUREG/CR or NUREG/CP series, or draft or final material for inclusion in SERs or ESs (see definitions below).

technical letter reports (also called technical evaluation reports) - interim or final letters that provide information on the technical aspects of the contract work. Interim technical letter reports may be required at various stages of a project. These interim letters usually are followed by a final technical letter report or a formal technical report. Final technical letter reports are usually specified in situations where the technical work is review and evaluation of work of others or work to be used by the staff in the licensing and regulation process. Interim letter reports may include, but are not limited to, informal (interim) progress reports, quick-look reports, data reports, status summary reports, project descriptions, pre-test predictions, model verifications, experiment safety analyses, experiment operating procedures, facility certification reports, and test result reports. These reports must be identified with the financial number (FIN) assigned to the project. They are not to be identified with DOE registered report codes. The number of copies to be prepared and the distribution of those copies will be specified by the project manager.

formal technical reports - the final product of research, an original investigation, or a significant compilation of information. This product is a formal technical report for publication in the NUREG/CR or NUREG/CP series. For extensive long-term projects, formal monthly, quarterly or semiannual and annual periodic technical reports may be required. A draft of the final or periodic report may be requested for comment prior to preparation of the camera-ready copy.

draft or final material for publication or inclusion in SERs, ESs, letters, or license amendments - written material requested for use in the NRC licensing process. Such material may be (1) abstracted in a NUREG report or attached to a NUREG report, (2) attached to a letter or an amendment to the license, or (3) abstracted and used as necessary by the NRC staff. NRC requires patent review and full management review of this material by the performing organization. This material is to be submitted to NRC as a technical letter report addressed to the project manager and identified by the FIN number.

For purposes of this Part, contractor means a private contractor, consultant, grantee, another State or Federal Agency working under an interagency agreement, or a DOE/facility or National Laboratory (contractor) and subcontractors.

B. REQUIREMENTS FOR FORMAL REPORTS

If the contractor is to prepare a final formal technical report for publication, state that it will be printed and distributed by NRC from camera-ready copy submitted by the contractor, unless the work is being done for the Office of Nuclear Regulatory Research by a DOE facility or Laboratory with a JCP-authorized printing plant. The camera-ready copy is to be prepared in accordance with the provisions of this appendix, Parts II and V (for contractors other than DOE contractors), or Parts IV and V of this appendix and Chapter 1102 (for DOE contractors). A style guide is also available free, upon request (NUREG-0650). If the report is to be printed by NRC and it is unclassified, the camera-ready copy is to be submitted by the contractor to the Director, Division of Technical Information and Document Control, NRC, Washington, D.C. 20555, by first class mail. For handling of sensitive unclassified and classified reports see Part V of this appendix and NRC Appendix 2101. Unclassified reports printed for the Office of Nuclear Regulatory Research should be handled in accordance with Parts IV and V of this appendix and/or Chapter 1102.

C. REQUIREMENTS FOR DRAFT REPORTS

If a draft is desired prior to completion of a final technical letter report, formal technical report, final material for inclusion in an SER or ES, or for comment by participants in cooperative programs with foreign governments and organizations and with U.S. industry, state that requirement and the time frame for delivering the final camera-ready copy after receiving NRC and/or participant comments on the draft. State that all draft material should be submitted to the cognizant project manager.

When the contractor is to submit draft material for comment prior to the preparation of the final report, state that if there are NRC program and/or participant comments the contractor will be asked to make changes. If agreement on the changes is reached, the NRC manager will authorize the contractor to prepare the final copy and submit it to the project manager, if it is a letter report or input to an SER or ES, or to the Director, Division of Technical Information and Document Control, if it is

camera-ready copy for printing and distribution. This is to be done to assure proper publication, handling, and distribution and, among other things, to preclude further changes that might nullify the agreement. If caveats were agreed to and the project manager wishes to check the final document for their presence, he/she should inform TIDC of that desire. In that case, upon receipt of the camera-ready copy by TIDC, the project manager will be informed and requested to prepare and sign the NRC Form 426A.

Also state that if agreement on changes to a formal technical report to be issued in the NUREG/CR series is not reached, the NRC project manager may request the contractor to prepare the camera-ready copy with, in addition to the standard disclaimer required on all contractor formal reports (see Exhibit 6), any caveats deemed necessary to cover NRC objections. Such caveats may range from the "The views expressed in this report are not necessarily those of the U.S. Nuclear Regulatory Commission" to the addition of a preface setting forth the NRC opinion or footnotes at appropriate locations within the text.

State that if NRC objections cannot be covered in this manner, NRC can refuse to publish the report. In the case of DOE/National Laboratory reports, the DOE Operations Office Manager responsible for that laboratory should be informed by the NRC Office Director or Regional Administrator of the decision and the reasons therefor, with a copy to the Laboratory Director. In the case of another Federal agency, a State, or a private contractor, the person who executed the contract should similarly be informed by the NRC Contracting Officer. The contractor is then free to publish without NRC identification of the report. Project manager or higher level decisions may be appealed to the NRC Executive Director for Operations.

D. PUBLISHING UNCLASSIFIED INFORMATION IN OPEN LITERATURE AND PRESENTING PAPERS

If the contractor's principal investigator is to be allowed to publish in the open literature instead of submitting a final report and/or present papers at public or association meetings during the course of the work, add the following statement to the Statement of Work:

The principal investigator(s) may publish the results of this work in the open literature instead of submitting a final report and/or present papers at public or association meetings at interim stages of the work.

If the project manager wants to review the paper or journal article prior to presentation or submission for publication, state this in the Statement of Work, as follows:

The principal investigator(s) may publish the results of this work in the open literature instead of submitting a final report and/or present papers at public or association meetings at interim stages of the work, if the article or paper has been reviewed by the NRC project

manager in draft form and agreement has been reached on the content. The applicable procedures set forth in Chapters NRC-3206 or NRC-1102 must be followed.

If agreement is not reached, NRC may also ask that the paper include in addition to the standard statement "Work supported by the U.S. Nuclear Regulatory Commission," any caveats deemed necessary to cover NRC objections. If NRC objections cannot be covered in this manner, NRC can refuse to authorize publication in the open literature and/or presentation of papers.

In the latter case, NRC will inform the contractor of the decision, as stated above for formal reports (see Section C, paragraphs 3 and 4). The contractor is then free to publish without NRC identification of the information. This will not affect payment of the contract work costs. Project manager or higher level decisions may be appealed to the NRC Executive Director for Operations.

If the contractor proposes to publish in the open literature or present the information at meetings in addition to submitting the required technical reports, approval of the proposed article or presentation should be obtained from the NRC project manager. The NRC project manager shall either approve the material as submitted, approve it subject to NRC-suggested revisions, or disapprove it. In any event, a project manager may disapprove or delay presentation or publication of papers on information that is subject to Commissioner approval that has not been ruled upon or which has been disapproved.

(See Chapter 3206 for provisions relating to payment of page charges and travel costs for presentation of papers.)

E. TYPOGRAPHY

The text of reports must be single spaced on 8½ x 11-in. paper, unless otherwise specifically authorized. Occasionally, reports with many symbols and mathematical expressions may require one and one-half spacing to provide for superscripts and subscripts. This spacing should be allowed where needed, but should be considered an exception, not the standard.

F. REPORTS CONTAINING SENSITIVE UNCLASSIFIED AND CLASSIFIED INFORMATION

Details of the marking of reports designated Official Use Only, Limited Official Use, Proprietary Information, Safeguards Information, and classified (Confidential, Secret, and Top Secret) are provided in Part V of this appendix and in NRC Appendix 2101.

G. PUBLISHING UNCLASSIFIED PROCEEDINGS OF CONFERENCES AND WORKSHOPS

NRC publishes or assists in the publication of compilations of papers presented at meetings, conferences, and symposiums in which NRC

participates as a sponsor or cosponsor. Chapter NRC-3207, "Conferences and Conference Proceedings," provides general information and guidance for this. More detailed guidance is available from TIDC upon request.

H. WRITING AND PUBLISHING UNCLASSIFIED BOOKS

NRC may, under certain circumstances, publish books prepared by grantees or contractors. For general information and guidance on book publishing, see Chapter NRC-3210, "Book Writing and Publishing."

I. DISTRIBUTION OF REPORTS TO CONTRACTORS

Up to 50 copies of unclassified formal technical reports may be retained by or will be bulk shipped to the contractor by NRC for internal use. If fewer than 50 copies are needed, indicate the desired quantity on NRC Form 426A. Single copies for specific individuals in organizations other than the contractor's organization who are not included in the distribution requested by the NRC project manager may be requested on a project basis or on a report-by-report basis. The request, with written justification, should be addressed to the NRC project manager, with a copy to NRC/TIDC. If the additional distribution is approved by the NRC project manager, the contractor shall send these copies (if printing is done by the contractor) and address labels, even if printing is done by NRC, to NRC/TIDC, where the distribution will be made along with the standard distribution. Distribution of sensitive unclassified and classified reports will be made by the project manager on a case-by-case basis.

J. COORDINATION OF PRESS OR OTHER MEDIA RELEASES OF UNCLASSIFIED INFORMATION

A contractor may request permission to issue a press or other media release on the work being done. Such request shall be made to the project manager, who will consult with his/her management and with the Office of Public Affairs. The contractor may not issue a press release on nonroutine information without this prior coordination. This coordination may be accomplished by telephone, with the NRC project manager responsible for expeditious handling. Decisions not to release information or delays in handling by the project manager may be appealed to the NRC Executive Director for Operations.

PART II

UNCLASSIFIED FORMAL CONTRACTOR REPORTS
TO BE PRINTED BY NRC

A. DOCUMENTATION

1. Applicability

- a. The requirements of this part apply to contractor and inter-agency agreement reports that are to be printed by NRC. Contractors may not print reports prepared for NRC except those DOE laboratories with JCP-authorized printing plants and then only those reports prepared for NRC's Office of Nuclear Regulatory Research.
- b. With respect to sensitive unclassified and classified reports, the requirements set forth in Part V of this appendix shall be used in conjunction with NRC Appendix 2101.
- c. The requirements of this part do not apply to consultants and contractors of the NRC boards, panels, and advisory committees which report directly to the Commission.

2. Front Cover and Title Page

- a. Separate covers and title pages are required (see Exhibits 1 and 2 for contractor reports and Exhibits 3 and 4 for reports prepared under or pursuant to interagency agreements).*
- b. The items shown in Exhibits 1 through 4 and discussed below shall appear on the title page and cover, as appropriate.**

(1) NRC Report Number

Each report shall be identified by an NRC-controlled alpha-numeric designation as the prime designation unique to that report. The centralized report control system for unique identification is maintained by the Division of Technical Information and Document Control. Numbers may be obtained by calling the Division of Technical Information and Document Control or by submitting a copy of NRC Form 426A (Exhibit 5) with a request for a number.

* Reproducible copy of the cover of the performing organization may be submitted; however, the data elements shown in Exhibit 1 must be included.

** These requirements meet the specifications of American National Standard ANSI Z39.18-1974, Guidelines for Format and Production of Scientific and Technical Reports, and ANSI Z39.23-1974, Technical Report Numbers.

PUBLICATION OF TECHNICAL REPORTS PREPARED BY
NRC CONTRACTORS, INCLUDING REPORTS PREPARED
UNDER OR PURSUANT TO INTERAGENCY AGREEMENTS

The NRC identification number will have the form:

NUREG/CR-XXXX or NUREG/CP-XXXX

where CP indicates conference proceeding. The contractor's report number, if any, may be inserted below the NUREG number on the title page and cover, as shown in Exhibits 1 through 4, if desired by the contractor.

When a report consists of more than one volume or binding or is issued in more than one edition, an appropriate volume, supplement, part or revision designation shall appear immediately below the report number.

(2) Title and Subtitle

- (a) Use a brief title that indicates clearly the subject matter covered in the report.
- (b) When a report is prepared in more than one volume, repeat the primary title on each volume.
- (c) If appropriate, show the type of report (e.g., annual report, final report, thesis, etc.) and the period covered as part of the subtitle.

(3) Personal Author(s)' Name(s)

Authors' names should be given on the title page and cover unless this is impractical, as in the case of annual reports which have many contributors. If authors' contributions are as editors, compilers, etc., so indicate on the title page following the names. In addition, list affiliation of each author only if affiliated with an organization other than the organization generating the document.

(4) Organization Identification

On the title page and cover, provide information of the type illustrated in Exhibits 1 through 4.

(5) Basis for Report Date(s)

- (a) The basis for dating may be shown along with the date on the title page. Various bases for dating are possible; e.g., date report completed, date reviews completed, date published, date distributed, etc.
- (b) More than one date, with the basis for each, may be shown where this is necessary.

3. Availability Information

All formal reports will be made available for sale by NRC and by the National Technical Information Service (NTIS). Exhibit 6 will be inserted on the inside of the front cover by the Division of Technical Information and Document Control.

4. Disclaimer

The following notice will be added during the printing step on the inside front cover (Exhibit 6): "This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, or any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for any third party's use, or the results of such use, of any information, apparatus, product or process disclosed in this report, or represents that its use by such third party would not infringe privately owned rights." The following additional statement, "The views expressed in this report are not necessarily those of the U.S. Nuclear Regulatory Commission" will be printed below the standard disclaimer, if appropriate. Other qualifying statements may be added, if needed (see Part I.C., Requirements for Draft Reports).

5. Previous Reports in Series

If the report being prepared is one in an ongoing series, list all previous reports in the series. Include report numbers and issuance dates. Place this list on the back of the title page.

6. Abstract

An abstract of 200 words or less shall be prepared for each formal report. Within the report, the abstract shall appear on a separate page between the list of previous documents in the series and the contents page.*

7. References and Bibliographies

Reports or other documents referenced in text, reference sections, bibliographies, and appendixes of unclassified regulatory and technical reports in the NUREG series must be available to the public either in the public domain (as in a public library, at the Government Printing Office, at the National Technical Information Service, or at other reference or sales outlets) or in the NRC Public Document Room. This means that references should not be made to personal communications and interviews, unpublished

*This preferred positioning of the abstract in the report need not be followed if the style manual of the originating organization requires a different location.

information and information with restricted distribution (e.g., proprietary, national security, official use only, etc.). If the unretrievable information is important and unrestricted, it can be quoted in the text, in footnotes, or in appendixes. If credit is due to individuals, they can be mentioned in the text or in an acknowledgement section. Availability may be stated collectively for all entries (see Exhibit 6).

Guidelines for developing and presenting reference material are provided in NUREG-0650, "Technical Writing Style Guide," published in November 1979 (see Appendix A, pp. 19-23, for specific guidance) and Supplement 1 dated February 1982.

8. Bibliographic Data Sheet

NRC Form 335 (Exhibit 7) shall be prepared and included in the camera-ready copy as the final right-hand page.

B. PATENT AND SECURITY REVIEWS

1. Patent Review

Patent implications shall be considered prior to approval of reports for public release so that disclosure will not adversely affect the patent rights of NRC or the contractor. If the work being reported is contractually managed through another government agency (e.g., DOE laboratories), that government agency should be requested by the contractor to perform the patent review. The result of such review shall be reported on NRC Form 426A in item 11 (Exhibit 5).

If NRC directly administers the contract or the contractor is unable to obtain a patent clearance from the government agency administering the contract, the responsible NRC contracting officer shall be consulted, and the responsible NRC project manager shall consider the patent implications. If there is no need for patent review because of the certainty that the report contains no description of novel technical developments which may be of an inventive nature, NRC Form 426A may be completed with the statement "Not Applicable" or "N/A" in the space for the Patent Counsel's signature. If there is a possibility that there is disclosure of developments of an inventive nature, the contracting officer shall request assistance from the NRC Patent Counsel, Office of the Executive Legal Director.

2. Security Review

In most cases, contractor reports will be unclassified. Should a report of sensitive unclassified or classified work be required, however, the NRC project manager must work with the NRC Division of Security to establish the appropriate procedures and inform the contractor of such procedures through the contracting officer. The standards for marking and handling such reports are given in Part V of this appendix and NRC Appendix 2101.

C. PROCEDURES FOR PRINTING AND DISTRIBUTING

1. Printing

Reproducible masters prepared in accordance with this appendix shall be transmitted to the Division of Technical Information and Document Control, accompanied by completed NRC Form 426A (Exhibit 5). NRC Form 426A must be signed by the NRC project manager or a contractor official authorized by the project manager. Such authorization shall be reported in writing to TIDC.

The Division of Technical Information and Document Control will review the masters for adherence to the standards set forth in this chapter and appendix and will arrange for printing and distributing the report. Unsatisfactory masters will be reported to the NRC project manager for appropriate contractual action by the contracting officer or, in the case of government agency or interagency agreement work, the publications manager of the performing organization.

2. Reprinting

Requests for reprinting any report subsequent to the initial printing require approval of the Division of Technical Information and Document Control. Each request shall include a written justification and the project manager's approval for reprinting along with address labels for the recipients.

3. Distribution of Reports

All copies of unclassified formal contractor reports will be distributed by the Division of Technical Information and Document Control in accordance with instructions on NRC Form 426A (Exhibit 5). The Division of Technical Information and Document Control will also arrange automatic distribution of these reports to the NRC Document Control System, the NRC Public Document Room, the National Technical Information Service (NTIS), the Government Printing Office and the Depository Library Service.

If any distribution is to be made other than, or in addition to, the standard distribution established for the report, written justification and the project manager's approval for printing additional copies shall accompany the reproducible masters when submitted to the Division of Technical Information and Document Control. Address labels for the additional distribution must be supplied.

Distribution of sensitive unclassified and classified reports will be made by the NRC project manager on a case-by-case basis.

EXHIBIT 1

SAMPLE COVER FOR UNCLASSIFIED FORMAL CONTRACTOR-PREPARED
DOCUMENTS, EXCLUDING THOSE PREPARED UNDER OR PURSUANT TO
INTERAGENCY AGREEMENTS

NRC Report No.
Contractor Report No. (if any)
Vol., Part, Rev., etc. (if any)

NUREG/CR-1676
NUSAC-556
Vol. 1

Title

Using Advanced Process Monitoring to Improve Material Control

Subtitle and Type of Report
(Annual, Topical, etc.)

Final Report
September 1979 - September 1980

Author(s)

Prepared by R. L. Hawkins, R. L. Lynch, R. F. Lumb

Contractor

NUSAC Incorporated

NRC

Prepared for
U.S. Nuclear Regulatory
Commission

EXHIBIT 2

SAMPLE TITLE PAGE FOR UNCLASSIFIED FORMAL CONTRACTOR-
PREPARED DOCUMENTS, EXCLUDING THOSE PREPARED UNDER OR
PURSUANT TO INTERAGENCY AGREEMENTS

NRC REPORT No.
Contractor Report No. (if any)
Vol., Part, Rev., etc. (if any)
Distribution Category No. (if any)

NUREG/CR-1676
NUSAC-556
Vol. 1

Title

Using Advanced Process Monitoring
to Improve Material Control

Subtitle and Type of Report
(Annual, Topical, etc.)

Final Report
September 1979 - September 1980

Report Dates and Bases

Manuscript Completed: September 1980
Date Published: September 1980

Author(s), Editor(s),
Compiler(s), etc.

Prepared by:
R. L. Hawkins, R. L. Lynch, R. F. Lumb

Contractor Name
and Address

NUSAC Incorporated
7926 Jones Branch Drive
McLean, VA 22102

NRC Sponsorship

Prepared for:
Division of Safeguards
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20566
NRC FIN B6437

NRC Contract No.

EXHIBIT 3

**SAMPLE COVER FOR UNCLASSIFIED FORMAL REPORTS PREPARED
UNDER OR PURSUANT TO INTERAGENCY AGREEMENTS**

NRC Report No.
Contractor Report No.
Vol., Part, Rev., etc.

NUREG/CR-1952
SAND81-0151

Title

**LOCA-Simulation Thermal-Shock
Test of Sliding-Link Terminal
Blocks**

Type of Report
or Subtitle

Independent Verification Testing Program
Independent Verification Test-1

Author(s), Editor(s)

Prepared by L. L. Bonzon, W. H. Buckalew, F. V. Thome, J. A. Lewin, T. W. Gilmore, SNL
W. R. Rutherford, A. B. Bennett, NRC

Contractor

Sandia National Laboratories

Sponsorship

Prepared for
U.S. Nuclear Regulatory
Commission

EXHIBIT 4

SAMPLE TITLE PAGE FOR UNCLASSIFIED FORMAL REPORTS PREPARED
UNDER OR PURSUANT TO INTERAGENCY AGREEMENTS

NRC Report No.
Contractor's Report No.
Vol., Part, Rev., etc.
Distribution
Category

NUREG CR 1962
SAND81-0151
R4

Title

LOCA-Simulation Thermal-Shock
Test of Sliding-Link Terminal
Blocks

Subtitle

Independent Verification Testing Program
Independent Verification Test 1

Report Dates

Manuscript Completed: January 1981
Date Published: May 1981

Author(s), Editor(s)

Prepared by:
L. L. Borison, W. H. Buckman, F. V. Thome, J. A. Lewis, T. W. Gilmore, S.N.L.
W. R. Rutherford, A. E. Bennett, NRC

Contractor's
Name and Address

Sandia National Laboratories
Albuquerque, NM 87185

NRC Sponsorship

Prepared for:
Division of Resident and Regional Reactor Inspection
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
NRC FIN B3101

NRC FIN No.

PUBLICATION OF TECHNICAL REPORTS PREPARED BY
 NRC CONTRACTORS, INCLUDING REPORTS PREPARED
 UNDER OR PURSUANT TO INTERAGENCY AGREEMENTS

NRC Appendix 3202
 Part II

EXHIBIT 5
 NRC FORM 426A, PUBLICATIONS RELEASE FOR UNCLASSIFIED
 NRC CONTRACTOR AND CONSULTANT REPORTS

NRC FORM 426A (2-79) NCRM 2301		U.S. NUCLEAR REGULATORY COMMISSION		1 REPORT NUMBER (If any)	(Check if already in Division of Technical Information and Document Center)
PUBLICATIONS RELEASE FOR UNCLASSIFIED NRC CONTRACTOR AND CONSULTANT REPORTS (Please Type or Print)				2 DISTRIBUTION CATEGORY NO. (If any)	(Check appropriate to form Sheet No. 497) Distribution 20 Copies, 1 set, 25¢ COLMIC 0563
3 TITLE AND SUBTITLE (State in full or abbrev. as required)					
4 AUTHOR (If more than one name has been followed by "et al.")					
5 NAME OF CONTRACTOR		MAILING ADDRESS (Number and Street, City, State and Zip Code)		TELEPHONE NO.	
6 DATE MANUSCRIPT COMPLETED	7 NRC PROGRAM SPONSOR TECHNICAL MONITOR				TELEPHONE NO.
8 CONTRACT DATA					
a. CONTRACT OR FIN NUMBER (Do not use DOE contract number)					
b. IF CONTRACTOR IS AUTHORIZED TO PRINT, PLEASE PROVIDE THE FOLLOWING INFORMATION:					
Number of Copies Printed		Estimated Completion Date		Estimated Printing Cost	
9 TYPE OF DOCUMENT (Check appropriate box)					
a. TECHNICAL REPORT					
(1) FORMAL					
(2) INTERIM					
b. CONFERENCE PAPER					
(1) TITLE OF CONFERENCE PAPER					
(2) DATES OF CONFERENCE					
(3) LOCATION OF CONFERENCE					
c. OTHER (Indicate type of report, e.g., thesis, speech, lecture notes, etc.)					
10 SPECIAL DISTRIBUTION (Send an copies to the Director, Office of Technical Information and Document Center. See NRC Form 426B for details. Make available only as approved by program office. Send to other addresses. Submit addresses for the entire NRC. See NRC Form 426C for instructions. Continue instructions on reverse of separate sheet, if necessary.)					
11 PATENT CLEARANCE (If applicable)			12 SUBMITTED BY		
Forward completed copies NRC Form 426A (along with the original documents) to: IN-20, TO: Appropriate Patent Counsel			a. NAME OF AUTHORIZED CONTRACTOR OFFICIAL OR NRC MONITOR		
x PATENT CLEARANCE NOT REQUIRED			7 OFFICIAL'S ORGANIZATIONAL UNIT		
b PATENT CLEARANCE GRANTED					
c PATENT CLEARANCE DENIED					
8 PATENT COUNSEL SIGNATURE		DATE	SIGNATURE (Authorized Official or NRC Monitor)		DATE

**EXHIBIT 6
DISCLAIMER AND AVAILABILITY STATEMENTS
(BACK OF COVER)**

NOTICE

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, or any of their employees, makes any warranty, expressed or implied, or assumes any legal liability of responsibility for any third party's use, or the results of such use, of any information, apparatus, product or process disclosed in this report, or represents that its use by such third party would not infringe privately owned rights.

NOTICE

Availability of Reference Materials Cited in NRC Publications

Most documents cited in NRC publications will be available from one of the following sources:

1. The NRC Public Document Room, 1717 H Street, N.W.
Washington, DC 20555
2. The NRC/GPO Sales Program, U.S. Nuclear Regulatory Commission,
Washington, DC 20555
3. The National Technical Information Service, Springfield, VA 22161

Although the listing that follows represents the majority of documents cited in NRC publications, it is not intended to be exhaustive.

Referenced documents available for inspection and copying for a fee from the NRC Public Document Room include NRC correspondence and internal NRC memoranda, NRC Office of Inspection and Enforcement bulletins, circulars, information notices, inspection and investigation notices, Licensee Event Reports, vendor reports and correspondence, Commission papers, and applicant and license documents and correspondence.

The following documents in the NUREG series are available for purchase from the NRC/GPO Sales Program: formal NRC staff and contractor reports, NRC-sponsored conference proceedings, and NRC booklets and brochures. Also available are Regulatory Guides, NRC regulations in the Code of Federal Regulations, and Nuclear Regulatory Commission issuances.

Documents available from the National Technical Information Service include NUREG series reports and technical reports prepared by other federal agencies and reports prepared by the Atomic Energy Commission, forerunner agency to the Nuclear Regulatory Commission.

Documents available from public and special technical libraries include all open literature items, such as books, journal and periodical articles and transactions. *Federal Register* notices, federal and state legislation, and congressional reports can usually be obtained from these libraries.

Documents such as theses, dissertations, foreign reports and translations, and non-NRC conference proceedings are available for purchase from the organization sponsoring the publication cited.

Single copies of NRC draft reports are available free, to the extent of supply, upon written request to the Division of Technical Information and Document Control, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at the NRC Library, 7920 Norfolk Avenue, Bethesda, Maryland, and are available there for reference use by the public. Codes and standards are usually copyrighted and may be purchased from the originating organization or, if they are American National Standards, from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

GPO Printed copy price _____

EXHIBIT 7
NRC FORM 335 - BIBLIOGRAPHIC DATA SHEET

NRC FORM 335 (3-84) APRIL 1982 335-1000 BIBLIOGRAPHIC DATA SHEET SEE INSTRUCTIONS ON THE REVERSE		U.S. NUCLEAR REGULATORY COMMISSION REPORT NUMBER (Assigned by NRC and 1 of 20, if any)	
3 TITLE AND SUBTITLE		2 LEAVE BLANK	
		4 DATE REPORT COMPLETED MONTH _____ YEAR _____	
5 AUTHOR(S)		6 DATE REPORT ISSUED MONTH _____ YEAR _____	
		8 PROJECT/TASK WORK UNIT NUMBER 9 FID OR GRANT NUMBER	
7 PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)		10 SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)	
12 SUPPLEMENTARY NOTES		11 TYPE OF REPORT	
		13 TRAC COVERED (Indicate date)	
13 ABSTRACT (200 words or less)			
14 DOCUMENT ANALYSIS - KEYWORDS/DESCRIPTORS		15 AVAILABILITY STATEMENT	
6 IDENTIFIERS/OPEN ENDED TERMS		16 SECURITY CLASSIFICATION (The page) _____ (The report) _____	
		17 NUMBER OF PAGES	
		18 PRICE	
		(Blank space for additional information)	

EXHIBIT 7 (Continued)
BACK OF NRC FORM 335

DO NOT PRINT THESE INSTRUCTIONS AS A PAGE IN THE NUREG REPORT

INSTRUCTIONS

NRC FORM 335, BIBLIOGRAPHIC DATA SHEET, IS BASED ON GUIDELINES FOR FORMAT AND PRODUCTION OF SCIENTIFIC AND TECHNICAL REPORTS, ANSI Z39.18-1974 AVAILABLE FROM AMERICAN NATIONAL STANDARDS INSTITUTE, 1430 BROADWAY, NEW YORK, NY 10018. EACH SEPARATELY BOUND REPORT—FOR EXAMPLE, EACH VOLUME IN A MULTIVOLUME SET—SHALL HAVE ITS UNIQUE BIBLIOGRAPHIC DATA SHEET.

1. **REPORT NUMBER.** Each individually bound report shall carry a unique alphanumeric designation (NUREG) assigned by the Division of Technical Information and Document Control, ADM, in accordance with American National Standard ANSI Z39.23-1974, Technical Report Number (STRN). Use uppercase letters, Arabic numerals, slashes, and hyphens only, as in the following examples: NUREG-0100, NUREG/CP-0010, NUREG/CR-0100, and NUREG/BR-0010. For reports in a series add "(ol)", Supp., Revision, and Addendum, when necessary. Add contractor cross-reference identification number (if any) below NUREG number, e.g., PNL-XXXX, SANDXX XXXX, SA1-XXXX.
2. **TITLE AND SUBTITLE.** Title should indicate clearly and briefly the subject (coverage) of the report, including any subtitle to the main title. When a report is prepared in more than one volume, repeat the primary title, add volume number and include subtitle for the specific volume. Use upper and lower case letters, but capitalize computer code names. Do not use acronyms and initialisms in titles, may be added in parenthesis.
3. **LEAVE BLANK.**
4. **DATE REPORT COMPLETED.** Each report shall carry a date indicating month and year project was completed.
5. **AUTHOR(S).** Use name(s) in conventional order (e.g., John R. Doe, J. Robert Doe). List author's affiliation if it is different from the performing organization.
6. **DATE REPORT ISSUED.** Each report shall carry a date indicating month and year published.
7. **PERFORMING ORGANIZATION NAME AND MAILING ADDRESS.** Give name, street, city, state, and ZIP code. List no more than two levels of an organizational hierarchy. Display the name of the organization exactly as follows: Division, Office, Organization or Government agency, and address.
8. **PROJECT/TASK/WORK UNIT NUMBER.** Use the project, task and work unit numbers under which the report was prepared (if any).
9. **FIN OR GRANT NUMBER.** Insert the FIN or grant number under which report was prepared.
10. **SPONSORING ORGANIZATION.** List NRC Division, Office, U.S. Nuclear Regulatory Commission, Washington, DC 20555.
11. **a. TYPE OF REPORT.** State draft, final, preliminary, topical, technical, regulatory, quarterly, etc., and, if applicable, inclusive dates.
b. PERIOD COVERED.
12. **SUPPLEMENTARY NOTES.** Enter information not included elsewhere but useful, such as Prepared in cooperation with, Presented at conference of, To be published, Docket No. When a report is revised, indicate whether the new report supersedes or supplements the older report.
13. **ABSTRACT.** Include a brief (200 words or less) factual summary of the most significant information contained in the report. If the report contains a significant bibliography or literature survey or multiple volumes mention it here. Abstract is to be prepared by author or project manager.
14. **DOCUMENT ANALYSIS**
 - a. **KEY WORDS/DESCRIPTORS.** Select from the Energy Data Base Subject Thesaurus, DOE/TIC 700R R-5, the proper authorized terms that identify the major concept of the research and are sufficiently specific and precise to be used as index entries for cataloging.
 - b. **IDENTIFIERS AND OPEN-ENDED TERMS.** Use identifiers for project names, code names, equipment designators, etc. Use open-ended (keyword) terms written in descriptor form (14a) for those subjects for which no descriptor exists in the thesaurus.
15. **AVAILABILITY STATEMENT.** Denote public releasability, for example "unlimited", or limitation for reasons other than security.
16. **SECURITY CLASSIFICATION.** Enter U.S. Security Classification in accordance with U.S. Security Regulations (i.e., unclassified).
17. **NUMBER OF PAGES.** Leave blank. (Added by NTIS)
18. **PRICE.** Leave blank. (Added by NTIS)

PART III

UNCLASSIFIED TECHNICAL LETTER REPORTS

A. FORMAT

1. Applicability

- a. The requirements of this part apply to unclassified contractor technical letter reports. (See Part I.A for definition.)
- b. The requirements of this part do not apply to consultants and contractors to the NRC boards, panels, and advisory committees which report directly to the Commission.

2. Requirements

Technical letter reports are prepared, duplicated and distributed in accordance with the requirements of the Statement of Work in the contract or in the Standard Order for DOE Work. Each such report must be identified with the financial number (FIN) assigned to the project. The number of copies to be prepared and the distribution of those copies will be specified by the project manager. If unclassified and non-sensitive, the NRC project manager is responsible for making such reports available in the NRC Public Document Room (PDR) by sending them to the PDR through the NRC Document Control System.

B. PATENT AND SECURITY REVIEWS

1. Patent Review

Patent implications shall be considered prior to approval of reports for public release so that disclosure will not adversely affect the patent rights of NRC. If the work being reported is contractually managed through another government agency (e.g., DOE laboratories), that government agency should be requested by the contractor to perform the patent review.

If NRC directly administers the contract or the contractor is unable to obtain a patent clearance from the government agency administering the contract, the responsible NRC contracting officer shall be consulted, and the responsible NRC project manager shall consider the patent implications.

If there is a possibility that there is disclosure of developments of an inventive nature, the NRC contracting officer shall request assistance from the NRC Patent Counsel, Office of the Executive Legal Director.

2. Security Review

In most cases, contractor technical letter reports will be unclassified. Should a report of sensitive unclassified or classified work be required, however, the project manager must work with the Division of Security to establish the appropriate security procedures and inform the contractor of such procedures. The standards for marking and handling such reports are given in Part V of this appendix and NRC Appendix 2101.

PART IV

UNCLASSIFIED FORMAL REPORTS TO BE PRINTED FOR THE NRC OFFICE OF NUCLEAR REGULATORY RESEARCH BY DOE LABORATORIES WITH JCP-AUTHORIZED FEDERAL PRINTING PLANTS

A. DOCUMENTATION

1. Applicability

- a. The requirements of this part apply to NRC staff who are responsible for agreements with DOE Laboratories and their contractors who print regulatory and technical reports required by NRC. (See also Chapter NRC-1102).
- b. With respect to sensitive unclassified and classified reports the requirements set forth in Part V of this appendix shall be used in conjunction with NRC Appendix 2101.
- c. The requirements of this part do not apply to consultants and contractors to the NRC boards, panels and advisory committees which report directly to the Commission.

2. Front Cover and Title Page

- a. Separate covers (of different paper than that of the text) and title page are required.*
- b. Items such as those shown in Exhibits 3 and 4 and discussed below shall appear on the front cover and title page, as appropriate.** While layouts and typefaces need not be exactly the same as in Exhibits 3 and 4, the items shall appear in approximately the locations indicated and with the same relative prominence.

(1) NRC Report Number

Each report shall be identified by an NRC-controlled alpha-numeric designation as the prime designation unique to that document. The centralized report control system for unique identification is maintained by the Division of Technical Information and Document Control. Numbers may

* The cover stock of the performing organization may be used; however it must include the data elements shown in Exhibit 3.

** These requirements meet the specifications of American National Standard ANSI Z39.18-1974, "Guidelines for Format and Production of Scientific and Technical Reports," and ANSI Z39.23-1974, "Technical Report Numbers."

be obtained by calling the Division of Technical Information and Document Control or by submitting a copy of NRC Form 426A (Exhibit 5) with a request for a number.

The NRC identification number will have the form:

NUREG/CR-XXXX or NUREG/CP-XXXX

The contractor's report number, if any, will be inserted below the NUREG number on the title page and cover, as shown in Exhibits 3 and 4, if desired by the contractor.

When a report consists of more than one volume or binding or is issued in more than one edition, an appropriate volume, supplement, part, or revision designation shall appear immediately below the report number(s). NRC report numbers on covers and title pages shall be shown entirely on one line to facilitate computer processing.

(2) Title and Subtitle

- (a) Use a brief title, which indicates clearly the subject matter covered in the report.
- (b) When a report is prepared in more than one volume, repeat the primary title on each volume.
- (c) If appropriate, show the type of report (e.g., annual report, final report, etc.) and the period covered as part of the subtitle.

(3) Personal Author(s)' Name(s)

- (a) Authors' names should be given on the title page and cover unless this is impractical, as in the case of annual reports which have many contributors. If authors' contributions are as editors, compilers, etc., so indicate on title page and cover following the names. In addition, list affiliation of each author only if affiliated with an organization other than the organization generating the report.
- (b) Authors may be identified on backstrips (spines) of bound volumes.

(4) Organization Identification

- (a) On the cover, provide the name of the contractor responsible for preparing the report, followed by "Prepared for the U.S. Nuclear Regulatory Commission."

(b) On the title page, provide information of the type illustrated in Exhibit 4.

(5) Basis for Report Dates(s)

(a) The basis for dating may be shown along with the date on the title page. Various bases for dating are possible; e.g., date report completed, date reviews completed, date published, date distributed, etc.

(b) More than one date, with the basis for each, may be shown where this is necessary.

3. Availability and Price Information

All formal reports will be made available for sale by NRC and NTIS. The statement shown in Exhibit 6 is required on the inside of the front cover.

4. Disclaimer

The following notice shall be added during the printing step on the inside front cover (Exhibit 6): "This report was prepared as an account of work sponsored by the United States Government. Neither the United States Government nor any agency thereof, or any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for any third party's use, or the results of such use, of any information, apparatus, product or process disclosed, or represents that its use by such third party would not infringe privately owned rights." The following additional statement, "The views expressed in this report are not necessarily those of the U.S. Nuclear Regulatory Commission" will be printed below the standard disclaimer, if appropriate. Other qualifying statements may be added, if needed (see Part I.C., Requirements for Draft Reports).

5. Previous Reports in Series

If the report being prepared is one in an ongoing series, list all previous reports in the series. Include report numbers and issuance dates. Place this list on the back of the title page.

6. Abstract

An abstract of 200 words or less shall be prepared for each formal report. Within the report, the abstract shall appear on a separate page between the list of previous documents in the series and the contents page.*

* This preferred positioning of the abstract in the document need not be followed if the style manual of the originating organization requires a different location.

7. References and Bibliographies

Reports or other documents referenced in text, reference sections, bibliographies, and appendixes of unclassified regulatory and technical reports in the NUREG series must be available to the public either in the public domain (as in a public library, at the Government Printing Office, at the National Technical Information Service, or at other reference or sales outlets) or in the NRC Public Document Room. This means that references should not be made to personal communications and interviews, unpublished information and information with restricted distribution (e.g., proprietary, national security, official use only, etc.). If the unretrievable information is important and unrestricted, it can be quoted in the text, in footnotes, or in appendixes. If credit is due to individuals, they can be mentioned in the text or in an acknowledgement section. Availability may be stated collectively for all entries (see Exhibit 6).

Guidelines for developing and presenting reference material are provided in NUREG-0650, "Technical Writing Style Guide," published in November 1979 (see Appendix A, pp. 19-23, for specific guidance) and Supplement 1 dated February 1982.

8. Bibliographic Data Sheet

NRC Form 335 (Exhibit 7) shall be prepared and included in the camera-ready copy as the final right-hand page.

B. PATENT AND SECURITY REVIEWS

1. Patent Review

Patent implications shall be considered prior to approval of reports for public release so that disclosure will not adversely affect the patent rights of NRC or the contractor. The DOE Operations Office responsible for the contractor should perform the patent review. The results of such review shall be reported by the contractor on NRC Form 426A in item 11 (Exhibit 5).

2. Security Review

In most cases, reports will be unclassified. Should a report of sensitive unclassified or classified work be required, however, the NRC project manager must work with the Division of Security to establish the appropriate classification procedures and inform the contractor. The standards for marking and handling such reports are given in Part V of this appendix and NRC Appendix 2101.

C. PROCEDURES FOR PRINTING AND DISTRIBUTING

1. Printing

Contractor reports may be printed only by a JCP-authorized printing plant and then only if prepared for the NRC Office of Nuclear Regulatory Research. Reports printed by the contractor and one reproducible master shall be submitted to the Division of Technical Information and Document Control, with completed NRC Form 426A. The number of copies specified by the Statement of Work for standard and incidental distribution shall be provided. The appropriate identifying number (NUREG/CR-___) may be obtained as discussed in Section A.2.b.(1).

2. Reprinting

Requests for reprinting of any report at NRC expense subsequent to the initial printing requires approval of the Division of Technical Information and Document Control. The request shall include a written justification and the project managers approval for the reprinting, along with address labels for the recipients.

3. Distribution of Reports

All copies of unclassified formal contractor reports will be distributed by the Division of Technical Information and Document Control in accordance with instructions on NRC Form 426A (Exhibit 5). NRC Form 426A must be signed by a contractor official authorized by the project manager. Such authorization shall be reported in writing to the Division of Technical Information and Document Control.

If any distribution is to be made other than, or in addition to, the standard distribution established for the report, written justification and the project manager's approval for printing additional copies shall accompany the reproducible masters when submitted to the Division of Technical Information and Document Control. Address labels for the additional distribution must be supplied.

The Division of Technical Information and Document Control will arrange automatic distribution of these reports to the NRC Document Control System, the NRC Public Document Room, the National Technical Information Service (NTIS), the Government Printing Office and the Depository Library Service.

Distribution of sensitive (unclassified) and classified reports will be made by the NRC project manager on a case-by-case basis.

PART V

REPORTS CONTAINING SENSITIVE UNCLASSIFIED
AND CLASSIFIED INFORMATION

A. APPLICABILITY

These procedures and exhibits of this part apply to sensitive unclassified and classified reports prepared by NRC contractors. These reports include those designated:

Official Use Only
Limited Official Use
Proprietary Information
Safeguards Information
Confidential
Secret
Top Secret

Only sufficient information is presented here to aid in the preparation of the properly marked covers, title pages, back covers, and text pages. Details of the NRC Security Program and specific provisions for determining when to use the markings exhibited are contained in NRC Appendix 2101.

The reports covered are defined as sensitive unclassified or classified. Sensitive unclassified information refers to information designated Official Use Only, Limited Official Use, and Proprietary Information. Sensitive unclassified information also includes Safeguards Information that must be protected from unauthorized disclosure pursuant to 10 CFR 73.21 and Section 147 of the Atomic Energy Act of 1954, as amended, information withheld from public dissemination under the Freedom of Information Act or Privacy Act, and information not to be exported to or disclosed to foreign countries.

Classified information as used in this part includes Restricted Data, Formerly Restricted Data or National Security Information that requires protection in one of the three classification categories described in Executive Order 12356: Top Secret, Secret or Confidential.

The uses of each of the sensitive unclassified and classified categories and the markings required on reports are discussed and exhibited in the following sections. All sensitive unclassified and classified reports are to be sent directly to the project manager.

B. OFFICIAL USE ONLY AND LIMITED OFFICIAL USE INFORMATION.

NRC regulations require an Official Use Only marking to be placed on a report only when the originator or other holder believes the marking is

essential to ensure proper handling. Reports designated Official Use Only will contain only unclassified information originated by or furnished to an NRC contractor which is to be withheld from public disclosure. The report on which the marking appears must be reviewed at the time a request for release is received to determine its releasability. The Official Use Only marking is notice of the originator's determination of the applicability of an exemption under the Freedom of Information Act or Privacy Act or both at the time of origination.

Official Use Only NRC contractor reports shall be marked as shown in Exhibits 8 through 10.

Limited Official Use information is information originated by the U.S. Department of State. A report originated by an NRC contractor that contains Limited Official Use information shall be marked as shown in Exhibits 11 through 13.

Procedures for reproducing, transmitting, protecting, and handling reports containing Official Use Only and Limited Official Use information and removing such reports from those categories are detailed in NRC Appendix 2101.

C. PROPRIETARY INFORMATION

Proprietary information is a specific type of Official Use Only information. Proprietary information includes:

1. trade secrets.
2. privileged or confidential research, development, commercial or financial information exempt from mandatory disclosure under 10 CFR Part 2, "Rules of Practice for Domestic Licensing Proceedings," Sections 2.740 and 2.790 and under 10 CFR Part 9, "Public Records," Section 9.5, "Exemptions."
3. information submitted in confidence to NRC by a foreign source, which has been determined by NRC to be unclassified.

Unclassified NRC contractor reports containing proprietary information shall be marked as shown in Exhibits 14 through 18. In each instance, the optional wording that describes the material being presented should be selected.

If a report contains both Official Use Only information and proprietary information, the front cover shall be marked as proprietary information and may also be marked as Official Use Only information, if necessary. Pages in the report that contain proprietary information may be marked accordingly, including, marginal or other indicators of the specific wording that is proprietary. Similarly, the pages that contain Official Use Only information without proprietary information may be marked Official Use Only.

Procedures for reproducing, transmitting, protecting and handling proprietary information reports and removing them from the proprietary information category are detailed in NRC Appendix 2101. A cover sheet (Exhibit 19) is to be placed on each hard copy of a report containing proprietary information.

D. SAFEGUARDS INFORMATION

Safeguards information may be of three types: (1) classified information, which is marked and handled as indicated in Section E, (2) unclassified information restricted under Section 147 of the Atomic Energy Act, which is marked and handled as described in this Section, and (3) unclassified information, which is publicly available and handled as indicated in Parts I through IV.

The safeguards information that is to be protected as described here is unclassified information used in a report which specifically identifies certain licensee's or applicant's detailed:

1. security measures for the physical protection of special nuclear material
2. security measures for the physical protection and location of certain plant equipment vital to the safety of production or utilization facilities.

Unclassified NRC contractor reports containing safeguards information that is to be protected shall be marked as shown in Exhibits 20 through 22.

Procedures for reproducing, transmitting, protecting, and handling safeguards information reports and removing them from the safeguards information category are detailed in NRC Appendix 2101. A cover sheet (Exhibit 23) is to be placed on each hard copy of a report containing safeguards information.

E. CLASSIFIED INFORMATION

Classified information is limited to Restricted Data, Formerly Restricted Data and National Security Information. The procedures for making classification determinations and for marking, reproducing, transmitting, protecting, and handling reports containing classified information and removing such reports from classified categories are detailed in NRC Appendix 2101. These procedures are too complex for summarizing here.

Classification determinations regarding NRC information may be made solely by authorized classifiers designated by NRC or DOE. Authorized classifiers are responsible for insuring that reports they determine to be classified are marked and protected in accordance with the provisions of NRC Appendix 2101.

It is important to note that information may not be classified in order to prevent or delay the release of information that does not require protection in the interest of national security. Basic scientific research information not clearly related to national security may not be classified.

**EXHIBIT B
SAMPLE COVER FOR A CONTRACTOR REPORT CONTAINING
OFFICIAL USE ONLY INFORMATION**

OFFICIAL USE ONLY

NUREG/CR XXXX (S)

Title
Subtitle and Type of Report

Author(s), Editor(s)
Contractor
Prepared for
U.S. Nuclear Regulatory Commission

WITHHOLD FROM PUBLIC DISCLOSURE

OFFICIAL USE ONLY

EXHIBIT 9
SAMPLE TITLE PAGE FOR A CONTRACTOR REPORT CONTAINING
OFFICIAL USE ONLY INFORMATION

OFFICIAL USE ONLY

NUREG/CR-XXXX (S)

Title
Subtitle and Type of Report

Manuscript Completed (date):
Date Published (month, year):
Author(s): Editor(s):
Contractor name and address

Prepared for:
Division
Office
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
NRC FIN No.

OFFICIAL USE ONLY

EXHIBIT 10
SAMPLE BACK COVER FOR A CONTRACTOR REPORT CONTAINING
OFFICIAL USE ONLY INFORMATION

OFFICIAL USE ONLY

OFFICIAL USE ONLY

EXHIBIT 11
SAMPLE COVER FOR A CONTRACTOR REPORT CONTAINING
LIMITED OFFICIAL USE INFORMATION

LIMITED OFFICIAL USE

NUREG/CR-XXXX (S)

Title
Subtitle and Type of Report

Author(s), Editor(s)
Contractor
Prepared for
U.S. Nuclear Regulatory Commission

WITHHOLD FROM PUBLIC DISCLOSURE

LIMITED OFFICIAL USE

**EXHIBIT 12
SAMPLE TITLE PAGE FOR A CONTRACTOR REPORT CONTAINING
LIMITED OFFICIAL USE INFORMATION**

LIMITED OFFICIAL USE

NUREG/CR-XXXX (S)

Title
Subtitle and Type of Report

Manuscript Completed (date)
Date Published (month, year)
Author(s), Editor(s)
Contractor name and address

Prepared for
Division
Office
U.S. Nuclear Regulatory Commission
Washington, D.C. 20540
NRC File No.

LIMITED OFFICIAL USE

EXHIBIT 13
SAMPLE BACK COVER FOR A CONTRACTOR REPORT CONTAINING
LIMITED OFFICIAL USE INFORMATION

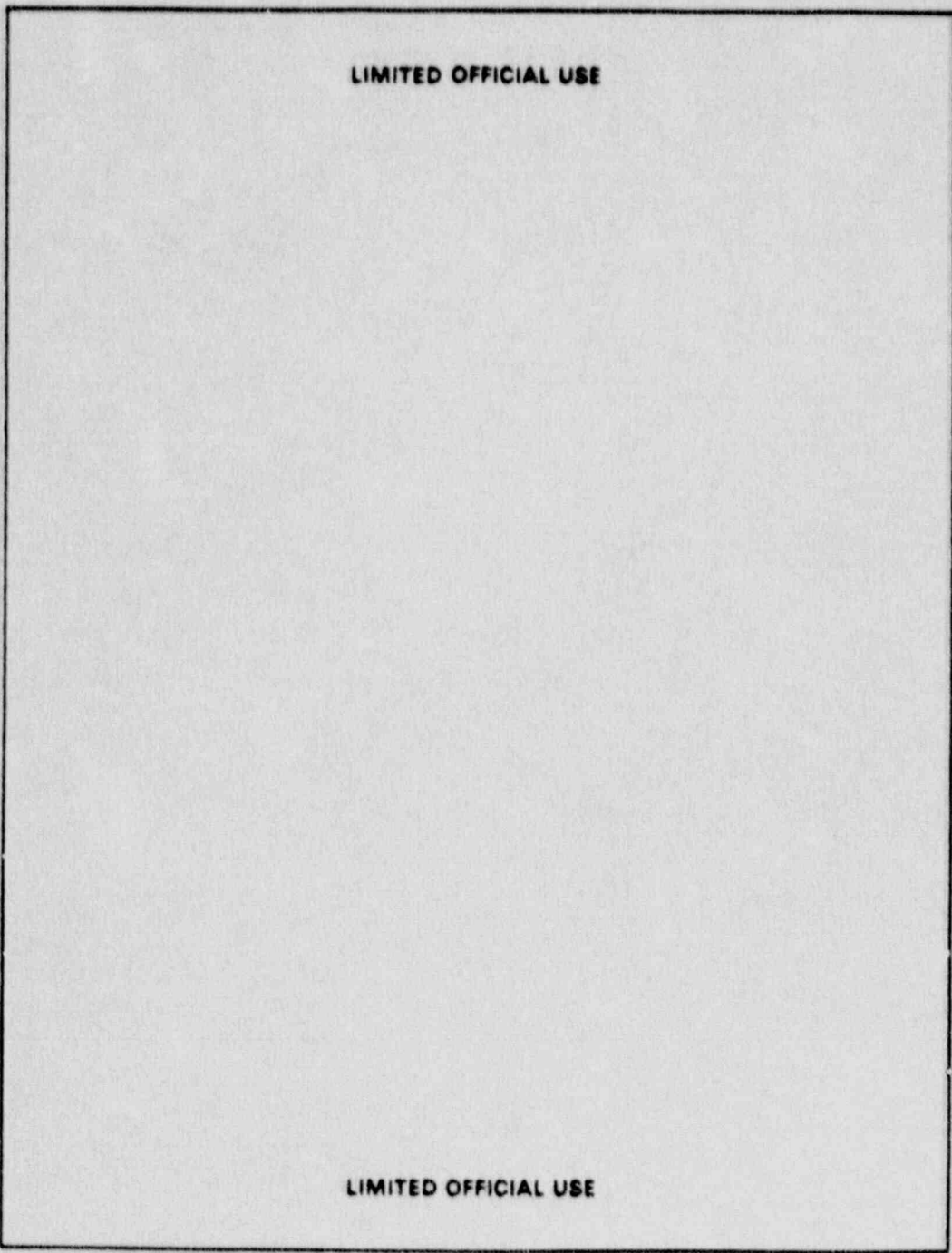


EXHIBIT 14
SAMPLE COVER FOR A CONTRACTOR REPORT CONTAINING
PROPRIETARY INFORMATION OBTAINED FROM A U.S. ORGANIZATION

PROPRIETARY INFORMATION

NUREG/CR-XXXX (P)

Title
Subtitle and Type of Report

Author(s), Editor(s)
Contractor
Prepared for
U.S. Nuclear Regulatory Commission

TRADE SECRET OR PRIVILEGED OR CONFIDENTIAL
COMMERCIAL OR FINANCIAL INFORMATION

This document contains information
submitted to NRC by

(Name of Company and Name of Submitter)

which has been determined (which is claimed)
to be proprietary in accordance with 10CFR
2.790 (b) (10CFR § 5) (10CFR Part 21) and is
exempt from mandatory public disclosure pur-
suant to 10CFR Part 9

WITHHOLD FROM PUBLIC DISCLOSURE

(Signature, Title and Office) (Date)

PROPRIETARY INFORMATION

EXHIBIT 15
SAMPLE COVER PAGE FOR A CONTRACTOR REPORT CONTAINING
PROPRIETARY INFORMATION OBTAINED FROM A FOREIGN SOURCE

PROPRIETARY INFORMATION	
NUREG/CR XXXX (PI)	
Title	
Subtitle and Type of Report	
Author(s), Editor(s) Contractor Prepared for U.S. Nuclear Regulatory Commission	
FOREIGN INFORMATION	
This document contains information submitted to NRC by	
_____ (Name of Company and Name of Submitter which is described in 10CFR 2.790 (d)(2) and is exempt from mandatory public disclosure pursuant to 10CFR Part 9	
WITHHOLD FROM PUBLIC DISCLOSURE	
_____ Signature Title and Office (Date)	
PROPRIETARY INFORMATION	

EXHIBIT 16
SAMPLE TITLE PAGE FOR A CONTRACTOR REPORT CONTAINING
PROPRIETARY INFORMATION OBTAINED FROM A U.S. ORGANIZATION

PROPRIETARY INFORMATION

NUREG/CR-XXXX (P)

Title
Subtitle and Type of Report

Manuscript Completed (date)
Date Published (month, year)

Author(s) Editor(s)
Contractor name and address

Prepared for
Division
Office
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
NRC FIN No.

TRADE SECRET OR PRIVILEGED OR CONFIDENTIAL
COMMERCIAL OR FINANCIAL INFORMATION

This document contains information submitted
to NRC by

Name of Company and Name of Submitter

which has been determined (which is deemed)
to be proprietary in accordance with (10CFR
2.790 (b)) (10CFR 9.5) (10CFR Part 21) and is
exempt from mandatory public disclosure pur-
suant to 10CFR Part 9

WITHHELD FROM PUBLIC DISCLOSURE

Signature Title and Office (Date)

PROPRIETARY INFORMATION

EXHIBIT 17
**SAMPLE TITLE PAGE FOR A CONTRACTOR REPORT CONTAINING
PROPRIETARY INFORMATION OBTAINED FROM A FOREIGN SOURCE**

PROPRIETARY INFORMATION

NUREG/CR-XXXX (P)

Title

Subtitle and Type of Report

Manuscript Completed (date)
Date Published (month, year)

Author(s) Editor(s)

Manuscript Completed (date)
Date Published (month, year)

Author(s) Editor(s)
Contractor name and address

Prepared for
Division
Office
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
NRC FIN No.

FOREIGN INFORMATION

This document contains information
submitted to NRC by

(Name of Company and Name of Submitter)

which is described in 10CFR 2.790 (d)(2)
and is exempt from mandatory public disclosure
pursuant to 10CFR Part 9

WITHHOLD FROM PUBLIC DISCLOSURE

(Signature, Title and Office) (Date)

PROPRIETARY INFORMATION

EXHIBIT 18
SAMPLE BACK COVER FOR A CONTRACTOR REPORT CONTAINING
PROPRIETARY INFORMATION

PROPRIETARY INFORMATION

PROPRIETARY INFORMATION

EXHIBIT 19
COVER SHEET FOR REPORT CONTAINING PROPRIETARY INFORMATION

PROPRIETARY INFORMATION

NOTICE

THE ATTACHED DOCUMENT CONTAINS "PROPRIETARY INFORMATION" AND SHOULD BE HANDLED AS NRC "OFFICIAL USE ONLY" INFORMATION. IT SHOULD NOT BE DISCUSSED OR MADE AVAILABLE TO ANY PERSON NOT REQUIRING SUCH INFORMATION IN THE CONDUCT OF OFFICIAL BUSINESS AND SHOULD BE STORED, TRANSFERRED, AND DISPOSED OF BY EACH RECIPIENT IN A MANNER WHICH WILL ASSURE THAT ITS CONTENTS ARE NOT MADE AVAILABLE TO UNAUTHORIZED PERSONS.

COPY _____
DOCKET NO. _____
CONTROL _____
REPORT _____
REC'D W/LTR DTD. _____

PROPRIETARY INFORMATION

Approved: December 10, 1980

Approved: August 29, 1984

**EXHIBIT 20
SAMPLE COVER FOR A CONTRACTOR REPORT CONTAINING
UNCLASSIFIED SAFEGUARDS INFORMATION**

SAFEGUARDS INFORMATION

NUREG/CR-XXXX (SG)

Title
Subtitle and Type of Report

Author(s), Editor(s)
Contractor

Prepared for
U.S. Nuclear Regulatory Commission

The determination that this document contains
safeguards information was made by

(Name) (Title) (Organization) (Date)

Violation of protection requirements of 10CFR
73.21 subject to civil or criminal penalties

SAFEGUARDS INFORMATION

EXHIBIT 21
SAMPLE TITLE PAGE FOR A CONTRACTOR REPORT CONTAINING
UNCLASSIFIED SAFEGUARDS INFORMATION

SAFEGUARDS INFORMATION

NUREG/CR-XXXX (SG)

Title

Subtitle and Type of Report

Manuscript Completed: (date)
Date Published: (month, year)

Author(s): Editor(s)
Contractor name and address

Prepared for
Division
Office
U.S. Nuclear Regulatory Commission
Washington, D.C. 20545
NRC File No.

SAFEGUARDS INFORMATION

EXHIBIT 22
SAMPLE BACK COVER FOR A CONTRACTOR REPORT CONTAINING
UNCLASSIFIED SAFEGUARDS INFORMATION

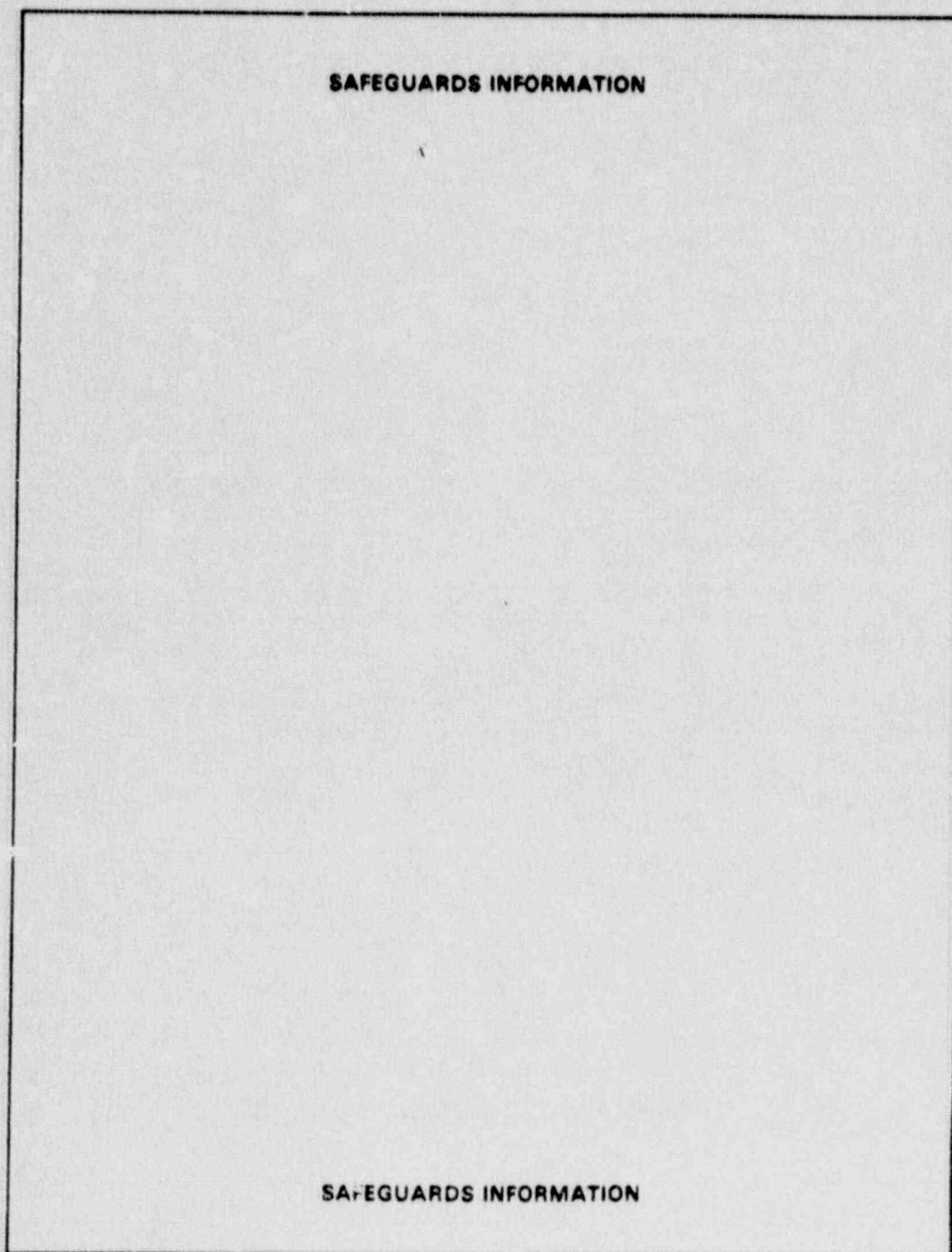


EXHIBIT 23
COVER SHEET FOR A CONTRACTOR REPORT CONTAINING
UNCLASSIFIED SAFEGUARDS INFORMATION

SAFEGUARDS INFORMATION

THIS DOCUMENT CONTAINS INFORMATION WHICH MUST BE PROTECTED FROM UNAUTHORIZED DISCLOSURE. 10 CFR 73.21 AND SECTION 147, ATOMIC ENERGY ACT OF 1954 APPLY. VIOLATIONS ARE SUBJECT TO CIVIL OR CRIMINAL PENALTIES.

THIS DOCUMENT IS NOT TO BE LEFT UNATTENDED OR ACCESSIBLE TO UNAUTHORIZED PERSONS. WHEN NOT IN USE, IT MUST BE STORED IN A LOCKED SECURITY STORAGE CONTAINER.

IT IS YOUR RESPONSIBILITY TO PROTECT THE INFORMATION CONTAINED IN THIS DOCUMENT FROM COMPROMISE, THEFT OR UNAUTHORIZED DISCLOSURE.

SAFEGUARDS INFORMATION

PART VI

HANDLING OF UNCLASSIFIED INFORMATION ON NRC COOPERATIVE
PROGRAMS WITH FOREIGN GOVERNMENTS AND ORGANIZATIONS
AND WITH U.S. INDUSTRY

The Nuclear Regulatory Commission has requested that its Program Offices establish, to the extent feasible, cooperative nuclear safety research programs that involve either or both U.S. industry and foreign governments and organizations. Such involvement includes monetary contributions, information exchange, and comments on program plans and results. This is authorized in 42 U.S.C. 5801. To this end, international and U.S. industry agreements have been signed that provide for transmitting unclassified information from NRC to participants. These procedures apply only to NRC-managed work not programatically funded by DOE.

The interests of all NRC cooperative nuclear safety research program participants are served best by early, rapid dissemination for comment of information on these programs developed for NRC by NRC contractors. This can be accomplished by distribution of "Draft Preliminary Reports (or Codes)" for comment for a specified period of time, followed by issue as formal NUREG/CR reports, with the concurrence of the participants. Specific procedures for accomplishing these goals and for transmitting information prepared by the NRC and DOE facilities and contractors and their subcontractors working on these programs are presented in the following sections. The procedures detailed here have been agreed to by DOE and have been provided to the responsible DOE Operations Officers and NRC Program and Project Managers as guidance.

A. PREPARATION OF DRAFT PRELIMINARY REPORTS FOR COMMENT

The first issuance of information by a contractor shall be designated "Draft Preliminary Report (or Code)," and shall include the cover sheet shown in Exhibit 24.

The following notice is to be printed on the bottom of the cover sheet (Exhibit 24):

NOTICE

THIS DRAFT PRELIMINARY REPORT IS ISSUED ONLY TO
PARTICIPANTS IN THE DESIGNATED COOPERATIVE PROGRAM

This report was prepared in contemplation of Commission action. It has not have received patent review and may contain information received in confidence. Therefore, the contents of this report should neither be disclosed to others nor reproduced, wholly or partially, unless written permission to do so has been obtained from the appropriate USNRC office. The recipient is requested to take the necessary action to ensure the protection of this report.

This notice has been agreed to by the legal staffs of both NRC and DOE and is not to be added to or changed. Any problem in this regard shall be brought to the attention of the NRC project manager, who will consult with the NRC legal staff.

The "Draft Preliminary Report (or Code)" shall be submitted by first class or express mail by the contractor to the NRC project manager, with the letter shown in Exhibit 25, in the number of copies specified by the project manager (in most instances this will be fewer than 20 copies). The contractor (DOE facility, contractor or subcontractor or other contractor) may retain copies only for internal use. DOE facilities and contractors and their subcontractors shall not distribute copies of this draft report to DOE/TIDC. Draft reports may be distributed to interested DOE program offices. Subsequent issues of the information shall also be designated "Draft Preliminary Report (or Code)" until the NRC project manager authorizes preparation of a NUREG/CR report.

"Draft Preliminary Reports (or Codes)" shall not be identified as NUREG/CR reports or carry any contractor report number or NRC distribution codes.

B. DISTRIBUTION BY NRC PROJECT MANAGERS

The NRC project manager will distribute the copies received only to (1) the participants in the program, (2) the NRC staff with a need-to-know, and (3) others authorized by the program or project manager. Transmittal to participants shall be by first class or express mail, including air mail to foreign participants. If premium cost mail services are to be used, a Division Director or comparable or higher authority must certify to the need on NRC Form 420, "Request for Premium Cost Mail Service." Premium cost mail is:

1. Express Mail, Priority Mail (First Class weighing more than 12 ounces)
2. International Express Mail (Air Mail weighing more than 10 ounces)

(See Chapter NRC-0255-058 and NRC Appendix 0255, Part V, Annex A)

C. COMMENT PERIOD AND ISSUANCE OF NUREG/CR REPORT

A minimum of six months will be allowed for comments and resolution of comments. At the end of the comment period, the NRC project manager shall, with the concurrence of the participants, authorize the contractor to issue the information as a NUREG/CR report in accordance with the provisions of this Chapter.

D. REPORT IDENTIFIERS

The "Draft Preliminary Reports (or Codes)" will be uniquely identified only by the Financial Identification Number (FIN) assigned by NRC and

the appropriate periodic notation, if any, included in the title (Exhibit 24). They shall not be given standard report nomenclature until the NRC project manager authorizes publication as a NUREG/CR report. At that time, the contractor may add its own designation below the NUREG/CR number, as shown in Exhibits 3 and 4.

E. MAILING TO PROGRAM PARTICIPANTS

The physical transmission of reports from NRC to program participants shall be handled by the Document Management Branch (DMB), Division of Technical Information and Document Control (TIDC), based on address labels of participants supplied by the project manager. The transmittal sheet shown in Exhibit 26 shall be used to transmit the documents and the labels to DMB.

F. SECURITY

If information included in the report or code has been determined to be sensitive unclassified or classified information (see statement of work) the procedures of Part V also apply. The report (or code) may not be classified solely for the purpose of limiting distribution to the participants.

EXHIBIT 24
SAMPLE COVER FOR A DRAFT PRELIMINARY REPORT (CODE)
FOR COMMENT

DRAFT PRELIMINARY REPORT (CODE) FOR COMMENT

FIN NO. _____

Title of Program

Subtitle for This Report, Including
Appropriate Periodic Notation, If Any
(e.g., First Quarter, Issue No. 1)

Prepared by (Name of DOE Facility, Contractor and/or
Subcontractors, if any)

for

U.S. Nuclear Regulatory Commission

NOTICE

**THIS DRAFT PRELIMINARY REPORT IS ISSUED ONLY TO
PARTICIPANTS IN THE DESIGNATED COOPERATIVE PROGRAM**

This report was prepared in contemplation of Commission action. It has not received patent review and may contain information received in confidence. Therefore, the contents of this report should neither be disclosed to others nor reproduced, wholly or partially, unless written permission to do so has been obtained from the appropriate USNRC office. The recipient is requested to take the necessary action to ensure the protection of this report.

EXHIBIT 25
**TRANSMITTAL LETTER FROM CONTRACTOR TO NRC PROJECT
MANAGER FOR DRAFT PRELIMINARY REPORT**

TO: NRC Project Manager

SUBJECT: DRAFT PRELIMINARY REPORT (CODE) ON
(PROGRAM TITLE) FOR COMMENT

The enclosed "Draft Preliminary Report (Code)" is being submitted for comment. It is our understanding that the comment period shall extend six months from the date of mailing of the draft to the participants. Upon resolution of the comments after that period and with concurrence of the cooperative program participants, the NRC Program Manager will authorize publication of this report in the NULG/CR series under the provisions of NRC Manual Chapter 1102 or 3202.

DOE Facility or Contractor Representative

EXHIBIT 26

TRANSMITTAL SHEET FOR REQUESTING
MAILING TO COOPERATIVE PROGRAM
PARTICIPANTS

Recipients: Addresses on attached labels

Method of Mailing:

- First Class Postal Service to U. S. addresses
- Express mail to U. S. addresses*
- Air mail to foreign addresses*
- Surface mail to foreign addresses
(may require up to three (3) months)

THIS MAILING CONTAINS NO PROPRIETARY INFORMATION OR OTHER
SENSITIVE UNCLASSIFIED INFORMATION

Special Instructions:

Individual Requesting Mailing:

Project Manager or High Authority

Enclosures:

1. Address labels
2. Documents to be mailed

*If premium cost mail services are to be used, a Division Director or comparable or higher authority must certify to the need on NRC Form 420, "Request for Premium Cost Mail Service." Premium cost mail is:

1. Express Mail, Priority Mail (First Class weighing more than 12 ounces)
2. International Express Mail (Air Mail weighing more than 10 ounces)

(See Chapter NRC 0255-058 and NRC Appendix 0255, Part V, Annex A)