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

OCT 17 1980

Parameter, Inc.
ATTN: Mr. Richard Lofy, President
13545 Watertown Plank Road
Elm Grove, WI 53122

Gentlemen:

Subject: Contract No. NRC-05-80-251, Task Order No. 5

Pursuant to the pertinent provisions of this contract, I hereby authorize the expenditure of $6,500.00 of the funds currently obligated under this contract to provide technical assistance and services in the independent metallurgical analysis of cracked bolts as outlined in the enclosed Task Order No. 5.

If you believe that the total ceiling price is inadequate for the purposes of this task order, you must so notify me within ten (10) business days after its receipt. Said notification shall contain your estimate of the required total ceiling cost. Within ten (10) business days after receipt of such notification, the Contracting Officer shall either ratify the total ceiling cost or adopt the proposed revised estimate or some combination of the two and revise or confirm the task order accordingly.

This letter, executed on behalf of the Commission, is forwarded to you in quadruplicate. Please acknowledge receipt on three (3) copies hereon and return them to me as soon as possible. The forth copy is for your retention.

Sincerely,

Kellogg V. Morton, Chief
Research Contracts Branch
Division of Contracts
Office of Administration

Enclosure:
Task Order No. 5 (4 copies)

RECEIVED:

Parameter, Inc.

(X) Agree
( ) Disagree
( ) Notification will be submitted by _____.
(Date)

BY: [signature]

TITLE: PRES.

DATE: 10/23/80

PARAMETER, INC.
Contract No. NRC-05-80-251
TASK ORDER NO. 5

1. Scope of Work

Provide NRC-IE assistance and services in the independent metallurgical analysis of cracked bolts as outlined in the statement of work below.

2. Background

On September 4, 1980, the NRC staff was informed by the Northern States Power Company that extensive cracking of the bolting for the steam generator supports attached to bottom of the steam generators had occurred. The licensee initially discovered the bolting problem when two bolts failed during detensioning. The licensee was attempting to remove the preload on the bolting (specified at 1400 ft.-lbs.) to minimize the potential for stress corrosion cracking of the high strength 1-1/2 inch diameter 250 ksi maraging steel bolting (Vascomax 250).

Ultrasonic examination of the support bolting revealed cracks or breaks in 47 of 48 support bolts for the two steam generators at the Prairie Island Unit 1 facility. The licensee subsequently shut down the Prairie Island Unit 2 facility and performed ultrasonic examinations of the same steam generator support bolting, that failed on Unit 1. The results of the UT examinations revealed cracks in three of the 48 steam generators support bolts. The licensee attempted to remove the cracked bolts from the steam generator supports. Two cracked bolts were successfully removed while the third failed during removal. Two bolts that were judged as defect free by the ultrasonic examination were also removed. Magnetic particle examination confirmed the results of the ultrasonic examinations on the bolts which were removed. As part of the short term corrective actions taken, the licensee has unloaded and retensioned the bolting at approximately 50 to 100 ft.-lbs.

3. Statement of Work

The actual laboratory analysis and evaluation shall consist of the following:

(a) Photograph the "as received" bolts to document the physical condition and to provide references for the location of sections removed for analysis.

(b) Perform optical metallographic examinations at appropriate magnification of the fracture face to characterize the macro topology of the fracture and to identify crack initiation sites; and of the bolt surfaces to identify cracks or other discontinuities that may be present. Document the examination results with representative photomicrographs.

(c) Perform optical metallography of selected specimen sections containing cracks to determine if the mode of cracking is trans or intergranular. Provide an evaluation of the material structure to determine if the structure is representative for the material. Provide representative photomicrographs which document the structure, cracking mode, and any anomalies observed.

(d) Conduct scanning electron metallography (SEM) studies and EDAX analysis of the fracture surface(s). Provide an appropriately documented evaluation of the following:

(1) Characterization of fracture surfaces - initiation sites, fracture morphology with respect to mode of failure, i.e., fatigue, stress corrosion, stress overload, etc.

(2) Analysis of identified deposits on thread and crack surfaces, and qualitative correlation with chemical analysis of base material.

(e) Perform mechanical test of the bolt material including tensile strength, yield strength, elongation and reduction of area to characterize the mechanical properties and verify conformance with specification limits.

(f) Perform hardness survey of crack areas and a standard hardness test to determine if mechanical properties of the bolt meets specification.

(g) Perform quantitative chemical analysis of bolt by the most appropriate method to suitably characterize the stud material and determine conformance to specification limits.

4. Report Requirements

Upon receipt of the bolt sample at the designated laboratory for analysis, the following reports are required:

(a) Results of laboratory analysis and evaluation as the work progresses shall be verbally communicated to the IE Headquarters Project Officer on a weekly basis.

(b) A preliminary report on the complete analysis and evaluation shall be submitted within 20 days for the Project Officer's review.

(c) Forty (copies) of a written final report shall be submitted to the IE Project Officer within 45 days.

5. Special Instructions

The NRC shall reimburse the contractor as invoiced for allowable costs incurred in shipment of the bolt samples to the designated laboratory for analysis.

All unconsumed portions of the bolts are to be properly identified and returned to the licensee upon completion of the analysis and evaluation.

6. Place of Performance

Parameter, Inc.

7. Cost Ceiling

$6,500.00