SEP 1 8 2002

Information Systems Laboratories, Inc.
ATTN: James Meyer
11140 Rockville Pike, Suite 500
Rockville, MD 20852

SUBJECT: TASK ORDER NO. 7 ENTITLED, "TRAC-M ASSESSMENT OF PWR STEAM
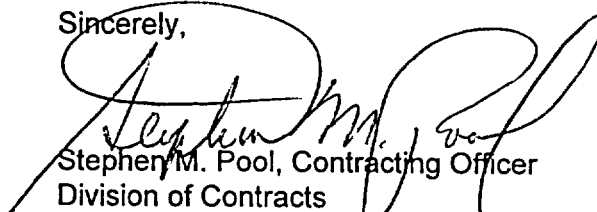AND FEEDWATER LINE BREAK" UNDER CONTRACT NO. NRC-04-02-054

Dear Mr. Meyer:

This letter definitizes Task Order No. 7 in accordance with the enclosed statement of work. The period of performance for Task Order No. 7 is September 10, 2002 through January 31, 2003. The task order estimated cost and fixed fee is set forth as follows: Estimated Costs:$50,701 Fixed Fee:$4049 CPFF Total:$54,750. $54,750 in funds is hereby allotted to this task order. The accounting data for this task order is set forth as follows: RES ID: RES-C02-485 APPN: 31X0200 B&R:26015110205 JCN:Y6392 BOC: 252A Amount Obligated This Action:$54,750
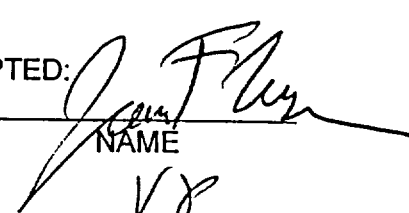
Please indicate your acceptance of Task Order No. 7 by having an official authorized to bind your organization execute three copies of this document, by signing in the space provided, and return two copies to me. You should retain the third copy for your records. All other terms and conditions of this task order remain unchanged.

Should you have any questions, regarding this task order, please contact me on (301) 415-8168.

Sincerely,

Stephen M. Pool, Contracting Officer
Division of Contracts
Office of Administration

ACCEPTED:

_____
NAME

_____
TITLE

9/12/02
_____
DATE

TEMPLATE-ADM 001   ADM02

BACKGROUND

The TRAC-M code will be used to simulate secondary system breaks in pressurized water reactors. The ultimate objective of this TRAC-M application is to determine thermal and hydraulic loads on steam generator internals (e.g. tube support plates, primary tubes) during steam and feedwater line breaks. To assure a high level of confidence in the TRAC-M predictions, assessments will be performed against applicable experimental data. Plant calculations will also be performed as a part of the assessment to assure consistency of the modeling approach used for actual plant applications. It is desired to qualify TRAC-M to predict the flow and void fraction in the tube bundle, differential pressures across structural members, thermal response of steam generator structures, and primary to secondary heat transfer.

To expedite the assessment process, existing decks will be used to the maximum extent possible. These could be TRAC-M, TRAC-B, TRAC-P or RELAP5 input decks. If a TRAC-M deck is not available, the existing deck from one of the other codes will be converted to a TRAC-M deck. Also, the selection of assessment cases will give preference to experiments that have previously been used as assessment cases. Availability and quality of the experimental data are an additional consideration to be used in selecting the assessment cases.

Several experiments will be used for the assessment, starting with relatively simple tests that exhibit the relevant phenomena, and progressing to integral tests scaled to represent a typical plant. The selected integral experiments include the Westinghouse Model Boiler (MB-2) and the GE Vessel Blowdown tests. Input decks exist for each of these facilities. The decks may require modifications to represent the specific test configurations. Experimental data are available in electronic format for at least some runs either from the NRC Data Bank, or from other sources.

OBJECTIVE

The objective of this task order is to verify the TRAC-M code's ability to determine the thermal and hydraulic conditions in a PWR steam generator following a main steam or feedwater line break. In the future, the TRAC-M code will be used to predict secondary and primary side thermal-hydraulic system response including critical flow, mass fluxes in the tube bundle, differential pressures across structural members, thermal response of steam generator structures, and primary to secondary heat transfer. In order to qualify TRAC-M's ability to perform this analysis, assessments will be performed against applicable experimental data.

WORK REQUIREMENTS

Task 1:   <u>Assess GE Vessel Blowdown Tests</u>

The GE vessel blowdown tests are particularly useful for assessing flashing phenomena and interfacial drag formulation. Vertical vessels, 1 foot and 4 feet in diameter, were initially pressurized and partially filled with saturated water. Both vessels were 14 feet high. Tests were initiated by opening a simulated break near the top of the vessel. Experimental data for two of the tests, 1004-3 and 5801-15, are available in the RELAP5 assessment matrix on the NRC Data Bank. TRAC-B decks are available for four of the test cases. At a minimum, TRAC-M simulations of tests 1004-3 and 5801-15 will be performed. If time permits, code prediction comparisons of other tests will be performed. The assessment will concentrate on simulation of void fraction distribution and vertical flow regimes in the depressurizing vessel.

TRAC-M predictions for mass flowrate, void fraction, pressure, differential pressure across structural members, and temperatures will be compared to experimental data. In addition to comparison plots against test data, the following vessel or steam generator variables will also be plotted:

void fraction for the important nodes at each vertical elevation, flow regime in each node for which void fraction is plotted, vapor generation at each node for which void fraction is plotted, differential pressure across each tube sheet, if applicable, pressure for the important nodes at each elevation, mass flow rate and quality out the break, and mass flow at each important vertical junction including cross flow, if applicable.

All TRAC-M files for the GE Vessel Blowdown tests analyzed will be provided to the NRC.

A letter report presenting results of assessment and validation studies will be delivered upon completion of activities.

Estimated Level of Effort: 1.1 staff-months
Estimated Completion Date: 12/31/02

Task2:   <u>Assess Westinghouse Steam Generator Model Boiler (MB-2) Tests</u>

MB-2 is an approximately 0.8% power/volume scaled model of the Westinghouse Model F steam generator. Loss of Feedwater (LOF), Steam Generator Tube Rupture (SGTR) and Steam Line Break (SLB) tests were run. A RELAP5 deck is available for LOF run 1712. This will need to be converted to a TRAC-M deck and modified to run the three steam line break tests, Runs 2013, 2025 and 2029. Files containing data for these tests are available in the NRC Data Bank.

TRAC-M predictions for mass flowrate, void fraction, pressure, differential pressure across structural members, and temperatures will be compared to experimental data. In addition to comparison plots against test data, the following vessel or steam generator variables will also be plotted:

void fraction for the important nodes at each vertical elevation, flow regime in each node for which void fraction is plotted, vapor generation at each node for which void fraction is plotted, differential pressure across each tube sheet, if applicable, pressure for the important nodes at each elevation, mass flow rate and quality out the break, and mass flow at each important vertical junction including cross flow, if applicable.

All TRAC-M files for the Westinghouse Steam Generator Model Boiler (MB-2) Tests analyzed will be provided to the NRC.

A letter report presenting results of assessment and validation studies will be delivered upon completion of activities.

Estimated Level of Effort: 1.5 staff-months
Estimated Completion Date: 12/31/02