006883

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

NOV 21 2001

Purdue Research Foundation
ATTN: Mr. Thomas B. Wright
1063 Hovde Hall, Purdue University
West Lafayette, IN 47907-1063

Dear Mr. Wright:

SUBJECT: MODIFICATION NO. 11 TO TASK ORDER NO. 2
UNDER CONTRACT NO. NRC-04-97-046

This letter definitizes Modification No. 11 to Task Order No. 2. This modification extends the period of performance, at no additional cost to the Government, through January 15, 2002. Accordingly, the period of performance for Task Order No. 2 is from 09/30/97 through 01/15/02. Also, this task order shall be performed in accordance with the enclosed, modified pages of the Statement of Work that include new, estimated completion dates for Tasks 5 and 16 under this effort.

The Contractor shall not incur costs for this task order which exceed the obligated amount of $1,804,216.60. **All other terms and conditions, including the ceiling of $2,095,489, remain unchanged.** No FY02 funds are obligated with this modification.

Please indicate your acceptance of Modification No. 11 to Task Order No. 2 by having an official, authorized to bind your organization, execute three (3) copies of this document in the space provided and return two (2) copies to the Contract Specialist, Ms. Amy Siller, at the address listed below. You should retain the third copy for your records.

U.S. Nuclear Regulatory Commission
ADM/DCPM/CMB1, Mail Stop T-7-I-2
Washington, DC 20555

If you have any questions concerning this action, please contact Ms. Siller at (301) 415-6747.

Sincerely,

for Robert Webber

Mary H. Mace, Contracting Officer
Contract Management Branch 1
Division of Contracts and Property Management
Office of Administration

Enclosure:
As stated

NOV 26 2001

TEMPLATE-ADM 001

ADM 02

ACCEPTED: MODIFICATION NO. 11 TO TASK ORDER NO. 2

NAME

Eric E. Fulkerson
Sr. Contract Manager

TITLE

NOV 28 2001

DATE

Modification (No.11) to the Statement of Work of Task Order #2, "Modularization of TRAC-P," under Contract # NRC-04-97-046 and Job Code W6749, "Thermal-Hydraulic Research"

Work Requirements (12/1/00 - 1/15/02)

This is a no-cost extension to extend the estimated completion dates of the following Tasks 5 and 16 to January 15, 2002.

Task 5. Provide Technical Assistance

This task provides technical assistance to NRC. Examples include technical presentations and tutorial session on the TRAC-M code, conference calls, meetings, and written correspondence to help the NRC staff gain adequate expertise to perform code development and maintenance functions.

Estimated Level of Effort: 2 staff-months (for this performance period)
Estimated Completion Date: January 15, 2002 (new date)

Task 16. Higher Order Numerical Methods

Incorporation of the External Component has facilitated coupling the consolidated code to other tools, such as CFD codes. CFD codes utilize higher-order differencing schemes, whereas the consolidated code is limited to a first-order technique. Unfortunately, when coupling two different order numerical schemes, numerically-induced bifurcations may be generated at the location of the coupling if strong gradients are present. Therefore, it may be necessary to incorporate higher-order numerics into the consolidated code.

First-order differencing limits the ability of the code to preserve gradients in physical properties, such as boron concentration and thermal and density fronts. A second-order method would ameliorate this limitation and improve the code's prediction of boron concentration and physical properties (such as density and temperature) that influence the core power predicted by a coupled kinetics code. These gradients also influence instability predictions, and a less numerically diffusive scheme would improve the code's ability to model these transients. Instability calculations are now performed only with the semi-implicit method, due to the high diffusion of the SETS scheme. However, SETS allows the code to run at larger time steps. It may be possible to run stability cases with SETS if a higher order scheme were used. This would result in a faster running code and would allow the semi-implicit option to be removed from the code, which would reduce the maintenance effort. (Note that RELAP5 currently has a method to sharpen the thermal gradient. This would not be needed if a higher order differencing scheme were implemented, thereby facilitating the RELAP5 consolidation.)

In order to efficiently couple the TRAC code to a CFD code and to minimize numerical diffusion to better represent gradients in physical properties, higher-order numerics should be incorporated into TRAC. This work has been facilitated by the modularization of the hydraulic component to hydraulic component communication in the code as well as the modularization of the solution procedure. Before the optimal means of providing this capability is determined, a pilot study of various approaches should be done so that final incorporation into TRAC is done efficiently and the run-time is not dramatically hindered.

TRAC code will be stripped down to minimize its complexity, leaving just the minimal coding required to run SETS and SEMI-IMPLICIT schemes for a network consisting of both one-dimensional and three-dimensional components. The numerical scheme will be modified to provide a second-order differencing technique, while leaving the first order technique in place. This approach will provide the ability to judge the benefit and detriment of the higher-order technique. Factors should include numerical diffusion, run-time, and numerical stability. Test cases should be devised to test these factors and should be run with both schemes to determine the most advantageous differencing method. Implementation is also a concern and the code architecture should also be studied and discussed to ensure that when incorporated into TRAC, the coding is readable and extendable. Provide a letter report to NRC to summarize the results of this study. All coding must be done in F90 and should be portable across all NRC platforms (SUN, SGI, HP, DEC Alpha, Windows NT, IBM AIX).

Deliverables: a letter report in both text and electronic format, and the pilot code developed during this study in electronic format.

Estimated Level of Effort: 5 staff-months (for this performance period)
Estimated Completion Date: January 15, 2002 (new date)