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

007693

JUN 04 2002

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

Dear Mr. Wright:

SUBJECT: MODIFICATION NO. 9 TO TASK ORDER NO. 1 UNDER CONTRACT NO. NRC-04-97-046

In accordance with Section G.4, Task Order Procedures, of the subject contract, this letter definitizes Task Order No. 1 Modification No. 9. The period of performance for Task Order No. 6 is extended from September 30, 1997 through December 31, 2002. The total estimated cost for performance of the task order is increased by $115,000 from $1,594,607 to $1,709,607. Funds in the amount of $115,000 are hereby obligated for performance of this task order bringing the total obligated funds from $1,594,607 to $1,709,607.

Accounting data for Task Order No. 1 MOD 9 is as follows:

B&R No.: 26015110205
Job Code: W6749
BOC Code: 252A
RES ID: RES-C02-426
Appropriation No.: 31X0200
Obligated Amount This Action: $115,000

TEMPLATE-ADM 001

ADM02

The issuance of this task order does not amend any terms or conditions of the subject contract.

Your contacts during the course of this task order are:

Technical Matters: James Han, Project Officer
(301) 415-6773

Contractual Matters: Stephen Pool, Contract Specialist
(301) 415-8168

Please indicate your acceptance of this task order by having an official, authorized to bind your organization, execute three copies of this document in the space provided and return two copies to the Contract Specialist. You should retain the third copy for your records.

Sincerely,

Stephen M. Pool, Contracting Officer
Division of Contracts and Property
Management

Enclosure:
As stated

ACCEPTED: TASK ORDER NO. 1 MOD 9

JUN 13 2002

NAME DATE

Eric E. Fulkerson
Sr. Contract Manager

TITLE

Modification (No. 9) to the Statement of Work of Task Order #1, "Interfacial Area Transport," under Contract # NRC-04-97046 and Job Code W6749, "Thermal-hydraulic Research"

Background

This is the last SOW for this contract. Final products of the contract include two NUREG/CR reports on interfacial area transport — one each for flow in vertical pipes (Purdue University) and in horizontal pipes (University of Wisconsin – Milwaukee).

Additional Work Requirements (5/20/02 - 12/31/02)

Modify Task 13 by extending the completion date to December 31, 2002. Add new Tasks 21 through 24 to the SOW.

Task 13. Provide Technical Support

Provide technical support in terms of making presentations, attending meetings, and reviewing technical reports as requested by the NRC Technical Monitor. Provide administrative support including contract modifications and fund transfer to the subcontractors under this contract.

Estimated Level of Effort: 0.1 staff-month (in addition to the previous estimate)
Estimated Completion Date: December 31, 2002 (new date)

Task 21. Finalize Two-Group Interfacial Area Transport Equation For Co-current Upward Flow in Pipes of Small Diameters (4-Inch ID or less)

In the previous performance periods, theoretical foundation of one-group and two-group interfacial area transport equations has been established, and experimental studies have been performed accordingly. As a result, the Purdue University team has developed or performed: (1) theoretical foundation of the one-group and two-group interfacial area transport equations, (2) constitutive relations for various bubble interaction phenomena including group interaction mechanisms, (3) extensive database covering bubbly to churn-turbulent flow conditions in various pipe sizes, and (4) preliminary benchmark studies on the two-group interfacial area transport equation.

However, additional experimental data are needed in order to finalize the model development. This task collects additional data in slug and churn-turbulent flow at higher flow rates, typical of nuclear reactor conditions. The data will be used to finalize constitutive relations for the two-group interfacial area transport equation for co-current upward flow in relatively small pipes (4-Inch ID or less).

Estimated Level of Effort: 4 staff-months
Estimated Completion Date: November 30, 2002

Task 22. Develop Preliminary Model For Co-current Downward Flow

Co-current downward flow is important in the safety analysis of the reactor coolant system. When the reactor undergoes a transient such as a loss-of-coolant or loss of heat sink accident, two-phase co-current downward flow can occur in certain locations. Since the gas phase is likely to move slower than the liquid phase, there are significant differences in the interface structures between the co-current upward flow and co-current downward flow. To account for the differences, this task will: (1) assess the constitutive relations in the interfacial area transport equation, previously

developed for the co-current upward flow, for co-current downward flow application; (2) either modify the existing model or develop a new model for additional bubble interaction mechanisms in the co-current downward flow conditions, if necessary; and (3) perform preliminary benchmark studies for the interfacial area transport equation for co-current downward flow.

Estimated Level of Effort: 2 staff-months
Estimated Completion Date: November 30, 2002

Task 23. Complete a NUREG/CR Report on Vertical Flow

This task completes a NUREG/CR report to summarize all the analytical and experimental work for interfacial area transport in vertical pipes, which has been performed at Purdue University.

Estimated Level of Effort: 2 staff-months
Estimated Completion Date: November 30, 2002

Task 24. Complete a NUREG/CR Report on Horizontal Flow

This task completes a NUREG/CR report to summarize all the analytical and experimental work for interfacial area transport in horizontal pipes and other geometries, which has been performed at the University of Wisconsin – Milwaukee.

Estimated Level of Effort: 2.5 staff-months
Estimated Completion Date: November 30, 2002

Meetings and Travel:

The contractor is expected to attend a one-day meeting at the NRC office in Rockville, Maryland. For planning purpose, the meeting will involve two persons. However, any travel must be approved in advance by the NRC Technical Monitor.