

MAY 24 2000

Purdue Research Foundation
ATTN: Edie Doland
1063 Hovde Hall, Purdue University
West Lafayette, IN 47907-1063

Dear Ms. Doland:

**SUBJECT: TASK ORDER NO. 10 ENTITLED "OECD/NRC BENCHMARK FOR A BWR
TURBINE TRIP TRANSIENT" 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. 10. This effort shall be performed in accordance with the enclosed Statement of Work. Tasks 1 and 2 of this task order will constitute the basic task order which is hereby authorized at an estimated cost of \$25,000. Tasks 3 and 4 will constitute a separately priced option at an estimated cost of \$35,000, and tasks 5, 6, and 7 represent a second separately priced option at an estimated cost of \$40,000. These separately priced optional tasks may be exercised unilaterally and sequentially by the Government via task order modification within 60 days of the expiration of the task order.

The period of performance for Task Order No. 10 is May 15, 2000 through November 30, 2000. The total estimated cost for full performance of the basic task order (tasks 1 and 2) is \$25,000. Funds in the amount of \$25,000 are hereby obligated for performance of this task order. The Contractor shall not incur costs for this task order which exceed this obligated amount of \$25,000.

Accounting data for Task Order No. 10 is as follows:

B&R No.: 060-15-11-013-5
Job Code: W-6749
BOC Code: 252A
RES ID: RES-C00-423
Appropriation No.: 31X0200
Obligated Amount This Action: \$25,000

The following individuals are considered by the Government to be essential to the successful performance of the work hereunder:

Kostadin Ivanov

The contractor agrees that such personnel shall not be removed from the effort under this task order without compliance with Contract Clause H.2-Key Personnel

Template = ADM001

ADM02

Purdue

Contract No. NRC-04-97-046
Task Order No. 10
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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) 415-6023

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. 10

NAME

Dist: JHan, Acct, orange file

TITLE

DATE

ADM:DCPM:GMB1
SPOOL

5/24/00

STATEMENT OF WORK for Task Order #10, "OECD/NRC Benchmark for a BWR (Peach Bottom-2) Turbine Trip Transient," under Contract #NRC-04-97-046 and Job Code W6749, "Thermal-Hydraulic Research"

I. Background

The Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development (OECD) is completing under the NRC sponsorship a PWR Main Steam Line Break (MSLB) Benchmark against coupled thermal-hydraulic (T-H) and neutron kinetics codes.

It was felt among the participants that there should also be a benchmark against the codes for a BWR transient. As a result, this project is established to challenge the thermal-hydraulic /neutron kinetics codes against a Peach Bottom-2 (a GE-designed BWR/4) turbine trip transient with a sudden closure of the turbine stop valve. This transient test was performed at the Peach Bottom-2 Nuclear Power Plant in April 1977, and the actual plant data were collected. The purpose of the test was to investigate the effect of the pressurization transient (following the sudden closure of the turbine stop valve) on the neutron flux in the reactor core. The transient was selected for benchmark, because it is a dynamically complex event for which neutron kinetics in the core was coupled with thermal-hydraulics in the reactor primary system.

II. Objectives

The objective of this work is to coordinate, conduct, and report an international benchmark to challenge the thermal-hydraulic/neutron kinetics codes against the Peach Bottom-2 turbine trip transient.

III. Work Requirements

First, to collect information for the benchmark, the Contractor shall collaborate with the Philadelphia Electric Company (PECO), the Peach Bottom Plant owner, and also with the Electric Power Research Institute (EPRI), publisher of the Peach Bottom-2 turbine trip test data (shown as Test Number TT2 in EPRI Reports NP-563 and NP-564).

Second, the Contractor shall assist the participants to obtain Peach Bottom-2 design information, which is needed for code input preparation, and test data for comparison. In addition, as discussed below, the Contractor will provide core power distribution, some initial and boundary conditions, and neutron kinetics information to the benchmark participants. As a result, the Contractor will have to perform benchmark reference calculations for the Peach Bottom-2 turbine trip transient using a coupled three-dimensional (3D) TRAC-BF1/NEM code. (Note that the TRAC-M/PARCS code will be used by Purdue University to calculate the same transient under a separate contract with NRC.)

Third, **the benchmark is divided into three separate exercises. The first exercise** is for the participants to perform a thermal-hydraulic system calculation (no neutron kinetics involved) for the Peach Bottom-2 turbine trip transient using the Contractor-supplied three-dimensional (3D) core power distribution (see Task 1 below). The core power distribution will be determined by the Contractor through a combination of TRAC-BF1/NEM reference calculations and test data. **The second exercise consists of two options. Option 1 of the second exercise** is to perform a coupled 3D kinetics/T-H calculation for the reactor core using the Contractor-provided boundary conditions at core inlet and exit. **Option 2 of the second exercise** is to

perform a coupled 1D neutron kinetics for the core and 1D thermal-hydraulics for the reactor primary system. The participants can participate in either or both options. **The third exercise** is perform a coupled 3D neutron kinetics/thermal-hydraulics calculation for the core with 1D thermal-hydraulics for the rest of the primary system.

Task 1. Develop Benchmark Specifications

Develop and issue the benchmark specifications that are based on the Peach Bottom-2 test data for the turbine trip transient and prepared in a format similar to the PWR MSLB Benchmark Final Specifications [NEA/NSC/DOC(99)8, April 1999]. The benchmark specifications should also include a complete set of the initial and boundary conditions that are needed for the participants to perform the aforementioned three exercises.

Included in the benchmark specifications are:

- (1) Thermal-hydraulic plant data
- (2) Neutron kinetics core specifications including core geometry, neutron modeling and composition map.
- (3) Macroscopic cross-section library with exposure distribution accounted for through cross-sections.

The benchmark specifications will be made available in electronic format to the participants. In addition, the Contractor is required to supply the NRC with the input decks used in the TRAC-BF1/NEM calculations along with the applicable neutron cross-section library.

Estimated Level of Effort: 2 staff-months
Estimated Completion Date: July 31, 2000

Task 2. Conduct First Workshop on Benchmark

Conduct the first workshop on the benchmark exercises for the Peach Bottom-2 turbine trip transient. Information needed for the exercises should be clearly presented to the participants at the workshop to help them proceed with the calculations in a timely manner.

Estimated Level of Effort: 1 staff-month
Estimated Completion Date: November 30, 2000

Task 3. Compile Results for the First and Second Exercises

This task collects from the participants their analytical results for the first and second exercises and publish the results in a standardized graphical form with a descriptive narrative summarizing the comparison among the participants' results, the Contractor-performed reference calculations, and test data.

Estimated Level of Effort: 3 staff-months
Estimated Completion Date: October 31, 2001

Task 4. Conduct Second Workshop

Conduct a second workshop for the participants to focus on resolving issues which may have arisen in the analyses of the first two exercises, and discuss any issues related to the third exercise.

Estimated Level of Effort: 1 staff-month
Estimated Completion Date: December 30, 2001

Task 5. Compile Results for the Third Exercise

This task collects from the participants the analytical results for the third exercise and publish the results in a standard graphical form with a descriptive narrative summarizing the comparison among the participants' results, the Contractor-performed reference calculation, and test data.

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

Task 6. Conduct a Final Workshop

This task conducts a third workshop on benchmark to resolve issues related to the third exercise, to address any outstanding issues, and to reach an agreement on the technical basis for the final report (to be prepared under Task 7).

Estimated Level of Effort: 1 staff-month
Estimated Completion Date: May 31, 2002

Task 7. Prepare a Final Report

Prepare a final benchmark report in the same format as used in the PWR MSLB Benchmark. The final report will be published as an OECD/NEA and NUREG/CR report.

Estimated Level of Effort: 2 staff-months
Estimated Completion Date: August 31, 2002

IV. Meetings and Travel

It is anticipated that the contractor will attend two meetings in Philadelphia and three meetings at NRC in Rockville. Two or three people will attend each meeting.

The contractor may propose additional domestic travel that is deemed necessary for the successful completion of this contract. However, any additional travel needs to be approved in advance by the NRC Project Officer.