



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

MAR 13 2001

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

SUBJECT: MODIFICATION NO. 6 TO TASK ORDER NO. 3 ENTITLED, "SCDAP/RELAP5  
THERMAL-HYDRAULIC CODE MAINTENANCE" UNDER CONTRACT NO.  
NRC-04-97-039

Dear Mr. Meyer:

The purpose of this modification is to (1) incorporate a within-scope change to continue performance of code maintenance for the SCDAP/RELAP5 code in accordance with the attached statement of work and ISL's proposal dated March 7, 2001, (2) make appropriate adjustments to the task order estimated cost and fixed fee, (3) decrease the period of performance to an expiration date of September 30, 2001, and (4) provide incremental funding in the amount of \$70,000.00.

Paragraph 2 of the definitization letter is deleted in its entirety and the following is substituted in lieu thereof:

"The period of performance for Task Order No. 3 is March 24, 2000, through September 30, 2001. The estimated cost and fixed fee for full performance of this task order is changed as follows:

	FROM:	REDUCE LOE DECREASE BY:	ADD TASKS INCREASE BY:	TO:
Estimated Costs	\$229,668.00	(\$58,021)	\$123,512	\$295,159
Fixed Fee	16,097.00	(4,061)	8,646	20,682
CPFF	\$245,765.00	(\$62,082)	\$132,158	\$315,841

\$70,000 in incremental funds is hereby allotted to this contract. This brings the amount currently obligated by the Government with respect to this task order to \$311,738, of which \$291,325 represents funds for reimbursable costs and the amount of \$20,413 represents funds for the fixed fee. It is estimated that the amount currently allotted will cover performance through August 31, 2001."

Accounting Data for Modification No. 6 to Task Order No. 3 is as follows:

Commitment No: RES-C01-393  
APPN No: 31X0200  
B&R No: 16015110110  
JOB CODE: W6706  
BOC No: 252A  
Obligated Amount: \$70,000.00

ISL

-2-

NRC-04-97-039 TO#3 Mod 6

A summary of obligations for this task order, from award date through the date of this action is given below:

Total FY00 Obligation Amount:	\$ 61,738.00
Total FY01 Obligation Amount:	250,000.00

Cumulative total of NRC obligations:	\$311,738.00
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Please indicate your acceptance of Modification No. 6 to Task Order No. 3 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 modification, please contact me on (301) 415-8168.

Sincerely,

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

ACCEPTED: 

NAME

V. P.

TITLE

3/10/01

DATE

STATEMENT OF WORK  
MODIFICATION TO TASK ORDER #3  
Mod 6

- I. Reduce the effort for Subtask 6.2 - SCDAP User Support from 4 staff-months to 3.

Reduction in Level of Effort: - 1 staff-month

- II. Reduce the effort for Subtask 6.3 - code Improvement from 4 staff-months to 3.

Reduction in Level of Effort: - 1 staff-month

- III. Reduce the effort for Subtask 6.6 - SCDAP Technical Support from 3 staff-months to 1.

Reduction in Level of Effort: - 2 staff-months

- IV. Add a new task, Subtask 6.7, for maintenance of the RADTRAD code with the following scope of work:

6.7 RADTRAD Maintenance

Maintain the RADTRAD code and distribute it per NRC/RES instruction. Provide minimal support to the users in installation of the code. Provide other support as requested by NRC/RES.

Estimate Completion Date: 10/31/01  
Estimated Level of Effort: 1 staff-month

- V. Add a new task, Subtask 6.8 - Evaluation of Steam Generator Tube Performance with the following scope of work:

6.8 Evaluation of Steam Generator Tube Performance

The objective of this task is to systematically address the uncertainty in the prediction of the thermal hydraulic conditions used for assessment of tube failure probabilities. The overall uncertainty in the analysis of severe accident thermal hydraulic boundary conditions seen by steam generator tubes can be broken down into the following areas:

- Plant Design Differences
- Accident Sequence Variations
- Inlet Plenum Mixing
- Tube to Tube Variations
- Core Melt Progression

The basic approach of this task is to build upon the analysis and understanding of severe accident thermal hydraulic conditions developed by the efforts in support of NUREG-1570, "Risk Assessment of Severe Accident-Induced Steam Generator Tube Rupture", March 1998, and more recent analysis performed in support of the Callaway electrosleeve review. This work, in turn, had built upon previous investigations of reactor system integrity performed in conjunction with examination of unintentional RCS

depressurization for severe accidents. The SCDAP/RELAP5 code will continue to be used as the principal tool for analysis of the tube thermal hydraulic boundary conditions attendant to severe accidents. The code has received peer review for this specific application and its basic modeling approach is founded on the test program conducted at the Westinghouse 1/7th scale test facility under a cosponsored EPRI/NRC program to measure natural circulation flow during a severe accident. Even though the code has been demonstrated to be capable of calculating bulk flow conditions and circulatory flow, it is difficult to argue its inherent capability to calculate variations in fluid conditions from one tube to another. To address tube to tube variations, supplemental methods/approach will need to be adopted as discussed below.

Subtask 6.8.1 has been completed by INEEL. It is listed here only as background to show the complete scope of the steam generator tube performance task. Subtasks 6.8.2 and 6.8.3 will be completed under this contract. The remaining subtasks will be completed under a follow-on contract.

#### 6.8.1 Plant Design Differences

Earlier work addressed design specific factors by evaluating a variety of plant designs (e.g., Surry, Zion, ANO-2, Oconee, and Calvert Cliffs). Design specific factors, which may influence the analysis, include orientation of the surge line. The vast majority of sensitivity studies were performed, however, only for the Surry design. Surry had been selected for the NUREG-1570 risk study. This new initiative will address uncertainties/sensitivities based on Zion plant specific analysis. This will widen the examination of uncertainties and address specifically a large class of plants.

The contractor shall complete a SCDAP/RELAP5 baseline calculation for the Zion plant to provide a general indication of the effects of plant design differences. As part of the work to baseline the Zion plant for this analysis any uncertainties or limitations identified in previous work will be reviewed and corrected if appropriate. The contractor shall propose a calculation scenario for baselining the Zion plant and submit that proposal for NRC approval. The proposed scenario should be based on insights gained from a review of the NUREG-1570, Callaway, and ANO-2 calculations. Upon approval of the proposed scenario by NRC, the contractor shall complete the plant design differences analysis and document the Zion results with a letter report.

Deliverable: Letter report documenting baseline analysis for the Zion plant. ("Task 32: Plant Design Differences under SCDAP/RELAP5 Code Improvement and Assessment, JCN 6095," INEEL letter report, November 2000)

#### 6.8.2 Accident Sequence Variations

Past evaluations of steam generator tube integrity have focused on "high-dry" severe accident scenarios in which the RCS remains at high pressure, steam generator inventory is not maintained and, as a further challenge to the tubes, one or more steam generators are depressurized. Station blackout events are symptomatically characteristic of this type of sequence. These high-dry sequences also included variations where RCS leakage, via reactor coolant pump seal leakage, allowed the depressurization of the primary system to the accumulator set point.

Additional work to be conducted under this task would address the effects of varying the sequences to include a) a SCDAP/RELAP5 calculation for SG depressurization in a non-pressurizer loop, b) two SCDAP/RELAP5 calculations with variations in reactor coolant pump seal leakage (which may involve intermediate leakage behavior because past analyses have considered large leakage [175-250gpm] and low leakage rates), and c) two SCDAP/RELAP5 calculations to address the effects of SG tube leakage on bulk RCS and steam generator responses. (This activity will be coordinated with the work to be done by the NRC to develop event trees or examine the range and frequency of sequences which could potentially lead to the conditions described above.)

Deliverable: Letter report documenting analyses addressing the effects of non-pressurizer loop SG depressurization, different reactor coolant pump seal leakage, and different tube leakage on bulk RCS and steam generator responses.

Estimated Completion Date: 5/31/01  
Estimated Level of Effort: 2 staff months

#### 6.8.3 Potential Conservatism

The contractor shall investigate the potential conservatism in the SCDAP/RELAP5 analysis for steam generator tube integrity. These potential conservatism are described in "Comparison of MAAP4 and SCDAP/RELAP5 Results," Presentation to NRC Staff, December 2000, and include modeling of thermal radiation in reactor coolant system (not modeled in RELAP5), the hot leg nozzle configuration and material, and heat transfer to water in the reactor vessel lower plenum. The contractor shall submit to the NRC the results of this investigation together with recommendations for revising the Base Case SCDAP/RELAP5 modeling to address any conservatism found to be significant. Following NRC approval of the recommendations, the contractor shall revise the modeling, rerun the Base Case, and analyze the results.

Deliverable: Letter report documenting the results of this investigation of potential conservatism together with recommendations for revising the Base Case SCDAP/RELAP5 modeling.

Estimated Completion Date: 7/31/01  
Estimated Level of Effort: 2 staff months

Deliverable: Letter report documenting the following work: revising the modeling, rerunning the Base Case, and analyzing the results.

Estimated Completion Date: 9/30/01  
Estimated Level of Effort: 2 staff months