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

SEP 2 8 2004

Information Systems Laboratories
ATTN: James F. Meyer, Vice-President and Manager
Nuclear Systems Analysis Division
11140 Rockville Pike, Suite 500
Rockville, MD 20852

Dear Mr. Meyer:

Subject: Contract No. NRC-04-04-065, Task Order No. 1 Entitled,
"Maintenance, Applications, and Nuclear Assessment (MANA)"

In accordance with Section G.4, Task Order Procedures, of the subject contract, this letter definitizes Task Order No. 1. This effort shall be performed in accordance with the enclosed Statement of Work.

Task Order No. 1 shall be in effect from the date of the task order through September 30, 2005 with a total cost ceiling of $302,239 for the total estimated reimbursable costs under the task order.

The total obligated amount of this task order is $274,00.00 ($246,146.70 obligated under this task order and $27,853.30 obligated under the basic contract which is to be allotted for Task Order No. 1).

Accounting Data for Task Order No. 1 is as follows:

APPN No.:	31X0200.460
B&R No.:	46015115107
JOB CODE:	N6072
BOC No.:	252A
Obligated Amount:	$246,146.70
RES Identifier:	RES-C04-483

[Note: $27,853.30 previously obligated under the basic contract is to be allotted for Task Order No. 1 under Accounting Data:

APPN No.:	31X0200.460
B&R No.:	46015115107
JOB CODE:	N6072
BOC No.:	252A
RES Identifier:	RES-C04-494]

The following individuals are considered to be essential to the successful performance for work hereunder [redacted]

The Contractor agrees that such personnel shall not be removed from the effort under the task order without compliance with Contract Clause H.3, Key Personnel.

TEMPLATE - ADM001

SISP Review Complete

ADM002

Your contacts during the course of this task order are:

Technical Matters: Michael B. Rubin, Project Officer
(301) 415-6769

Contractual Matters: Paulette Smith, Contract Specialist
(301) 415-6594

Please indicate your acceptance of this Task Order No. 1 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 above Contract Specialist. You should retain the third copy for your records.

If you have any questions regarding this matter, please contact Paulette Smith, Contract Specialist, on (301) 415-6594.

Sincerely,

for Mary Mace, Contracting Officer
Contract Management Branch 2
Division of Contracts
Office of Administration

Enclosure:
Statement of Work

ACCEPTED:

NAME

VP

TITLE

9/29/04

DATE

STATEMENT OF WORK
RES-04-065 TASK ORDER 1

TITLE: Implementation of ACR-700 Required Code Changes Into TRACE

I. BACKGROUND

The 700 MWe Advanced CANDU Reactor (ACR-700) is currently in the pre-Design Certification period of review. During this phase of the review AECL has been providing detailed information on the ACR-700 design and expected behavior during hypothetical accidents, and information on the current experimental database and anticipatory research programs applicable to ACR-700. Because of these interactions, we now have identified several code modifications that are needed for TRACE in order to analyze the ACR-700 under accident conditions. The needed code modifications have been identified in work performed under Task Order Number 12 of the MAAD contract. These modifications to TRACE are needed for the staff to independently analyze the ACR-700 for Chapter 15 and Chapter 19 accident scenarios, and to provide the basis for making sound regulatory decisions involving this design.

II. OBJECTIVE OF PROPOSED WORK

The objective of this task order is to obtain technical expertise from Information Systems Laboratory (ISL) to make modifications to TRACE and PARCS to allow TRACE/PARCS to simulate the ACR-700 reactor design under normal and accident conditions.

III. SCOPE OF WORK

All code development tasks will comply with "Software Quality Assurance Procedures for Thermal Hydraulic Codes", NUREG-1737. These tasks must adhere to TRACE standard F95 programming practices and design philosophies. Verification of the Software Design and Implementation Document (SDID) must demonstrate such adherence. For all tasks ISL will develop a draft Software Requirements Specification (SRS). NRC will review the draft SRS and provide feedback to ISL. After approval of the SRS, ISL will work on the SDID and coding. ISL will also develop a software testing plan. ISL will submit a draft SDID, TRACE code updates and verification test results to the NRC for comment and approval. The verification testing should include small test input decks and appropriate sample ACR-700 accident calculations demonstrating all new code functionality that are approved by the NRC. Finally ISL will develop appropriate TRACE and PARCS manual documentation for the new code models. The TRACE documentation will be developed using Adobe FrameMaker.

Task 1: Modify TRACE to Add a Header Tank Off-take Model

The ACR-700 design contains two feeder tubes for each channel that are connected to one of four common header tanks (two inlet and two outlet header tanks). During LOCA events different feeder tubes can see different inlet conditions depending on the position of their connection to the header tank. ISL will implement the Korean header off-take model into TRACE. The code should be implemented into TRACE in a modular fashion that will allow additional off-take correlations to be implemented easily.

Task 2: Modify TRACE to Add a CANCHAN Component

The ACR-700 design contains horizontal cylindrical pressure tubes that are located concentrically inside corresponding calandria tubes under normal operation. The fuel bundles contain rods of possibly different diameters arranged in a circular lattice. During some accidents the pressure tub can sag and come in contact with the calandria tube.

ISL will create a CANCHAN component that will be used to model the ACR-700 reactor core. The functional requirements for the CANCHAN component are:

1) The CANCHAN will use its own constitutive relations for wall drag, interfacial drag, wall heat transfer, and interfacial heat transfer.

2) The CANCHAN must track the two phase water level under horizontally stratified conditions inside the pressure tube. Wall drag, interfacial drag, wall convective heat transfer, interfacial heat transfer, radiation heat transfer must be calculated as a function of the two-phase level inside the pressure tube.

3) The CANCHAN will allow heat transfer from the pressure tube to the calandria. The component should have a simplified model to calculate pressure tube sagging and the increase in heat transfer to the calandria when the sagging occurs.

4) The CANCHAN should allow different standard bundle types to be built into TRACE and selected by the user through input similar to the way this is allowed for BWR fuel bundles in the CHAN component.

Task 3: Modify TRACE and PARCS to Allow Point Kinetics, 1D Kinetics, and 3D Kinetics Calculations to be Performed for the ACR-700 Reactor Geometry.

The ACR-700 core lattice differs significantly in design from the core lattices of conventional pressurized water reactors (PWRs) and boiling water reactors (BWRs). PWR and BWR fuel pins are laid out in long, square-grid fuel bundles with small lateral water gaps between bundles. ACR-700 fuel pins are laid out in rings within a 0.5-meter-long by 0.1-meter-wide cylindrical fuel bundle, twelve of which are loaded end-to-end inside each of the core's 284 pressure-tube fuel channels. The central natural-uranium fuel pin of the ACR-700 fuel bundle contains dysprosium, an integral absorber not used in U.S. PWRs or BWRs. The 284 fuel channels pass horizontally through a calandria vessel filled with a heavy water moderator at low temperature and pressure. Control and shutdown rods pass vertically through the low-pressure heavy-water moderator inside the calandria vessel, i.e., between and perpendicular to the fuel channels.

ISL will modify TRACE and PARCS to allow all reactivity and cross section feedback mechanisms to be modeled for the ACR-700.

IV. REPORTING REQUIREMENTS

1. A Monthly Letter Status Report is to be submitted to the NRC Project Manager by the 20th of the month with copies provided to the following:

   Office of Nuclear Regulatory Research Project Manager and Technical Monitor

   Division of Systems Analysis and Regulatory Effectiveness Management Analyst, (Kim Jones, Mail Stop T-10E32)

   Division of Contracts, Office of Administration (Mail Stop T-7I2) - **an electronic copy only to Mary Lynn Scott, email address mls2@nrc.gov and to Debra Robinson, email address djr1@nrc.gov. If the contractor cannot comply with the request for electronic transfer to the Division of Contracts, please provide a hard copy addressed to Ms. Scott, Mail Stop T-7 I2.**

   Division of Contracts and Property Management, Office of Administration (Mail Stop T-7I2)

   The Monthly Letter Status Report will identify the title of the project, the job code, the Principal Investigator, the period of performance, the reporting period, summarize each month's technical progress, list monthly spending, total spending to date, and the remaining funds. Any administrative or technical difficulties which may affect the schedule or costs of the project shall be immediately brought to the attention of the NRC project manager.

V. DELIVERABLES AND DELIVERY SCHEDULE

1. The draft SRS is to be prepared and provided to the staff by October 31, 2004.

2. The draft SDID, TRACE changes, and verification test results are to be prepared and provided to the staff by February 28, 2005.

3. The completion report, TRACE changes and code documentation are to be prepared and provided to the staff by April 30, 2005.

Note:

(1) NRC has implemented a new document management system, Agencywide Documents Access and Management System (ADAMS). For the present, contractors' mail will not be placed in ADAMS. All documents mailed to NRC (e.g., letters, technical reports, monthly letter reports, and other mail) should have "Addressee Only" on the envelope to keep it from being entered into ADAMS. Send mail for the addressee and cc's as separate mailings.

VI. MEETINGS AND TRAVEL REQUIREMENTS

Three trips for two persons for one day each to NRC Headquarters. Meetings are to take place with the NRC staff at the NRC headquarters facilities or the ISL Rockville office. Other travel such as technical professional society meetings to present papers may be considered if needed, but must be approved by the NRC Project Manager. Foreign travel must be approved by processing NRC Form 445, in addition to being provided as part of the approved proposal.

VII. LEVEL OF EFFORT

The total level of effort is estimated at 14 staff-months at the Senior Engineer level or higher.

VIII. PERIOD OF PERFORMANCE

The period of performance of this task order is August 15, 2004 through April 30, 2005.

IX. TECHNICAL DIRECTION

Technical direction will be provided by the Project Manager (Michael B. Rubin) and the Technical Monitor (Joseph Staudenmeier), who can be reached at:

Mail Stop: (T-10 K08)
U. S. Nuclear Regulatory Commission
Washington DC 20555-0001
Phone: (301) 415-7002
Fax: (301) 415-5160
Email: (jls4@nrc.gov)

X. PUBLICATIONS

RES encourages the publication of the scientific results from RES-sponsored programs in refereed scientific and engineering journals as appropriate. If the contractor proposes to publish in the open literature or present the information at a meeting in addition to submitting the required technical reports, approval of the proposed paper or presentation should be obtained from the NRC Project Manager prior to expending effort on the writing of the paper or presentation. When the writing is completed, the NRC Project Manager shall either approve the material as submitted, approve it subject to NRC-suggested revisions, or disapprove it. In any event, the NRC Project Manager may disapprove or delay publication or presentation of papers on information that is subject to Commission approval that has not been ruled upon or which has been disapproved. Additional information regarding the publication of NRC sponsored research is contained in NRC Management Directives 3.8, "Unclassified Contractor and Grantee Publications in the NUREG Series," and 3.9, "NRC Staff and Contractor Speeches, Papers, and Journal Articles on Regulatory and Technical Subjects."

If the paper or presentation is in addition to the required technical reports and the NRC Project Manager determines that it will benefit the NRC project, the Project Manager may authorize payment of publishing and/or travel costs, if any, from the project funds. If the Project Manager determines that the paper or presentation would not benefit the NRC project, the costs associated with the publication or presentation will be borne by the contractor. For any publications or presentations falling into this category, the NRC reserves the right to require that such publication or presentation will not identify the NRC's sponsorship of the work.

NEW STANDARDS FOR CONTRACTORS WHO PREPARE NUREG-SERIES MANUSCRIPTS

The U.S. Nuclear Regulatory Commission (NRC) is capturing its official records electronically. These records will be saved electronically in the Agency-wide Documents Access and Management System, known as ADAMS. The NRC is currently scanning each final NUREG-series publication from the printed copy. Therefore, submit your final manuscript that has been approved by your NRC Project Manager in both electronic and camera-ready copy.

All format guidance, as specified in NUREG-0650, Revision 2, will remain the same with one exception. You will no longer be required to include the NUREG-series designator on the bottom of each page of the manuscript. The NRC will assign this designator when we send the camera-ready copy to the printer and will place the designator on the cover, title page, and spine. The designator for each report will no longer be assigned when the decision to prepare a publication is made. The NRC's Publishing Services Branch will inform the NRC Project Officer for the publication of the assigned designator when the final manuscript is sent to the printer.

For the electronic manuscript, prepare the text in WordPerfect 8, and use any of the following file types for charts, spreadsheets, and the like.

File Types to be Used for NUREG-Series Publications	
File Type	File Extension
WordPerfect®	.wpd
Microsoft® PowerPoint®	.ppt
Corel® QuattroPro®	.wb3
Corel® Presentations	.shw
Lotus® 1-2-3	.wk4
Portable Document Format	.pdf

This list is subject to change if new software packages come into common use at NRC or by our licensees or other stakeholders that participate in the electronic submission process. If a portion of your manuscript is from another source and you cannot obtain an acceptable electronic file type for this portion (e.g., an appendix from an old publication), the NRC can, if necessary, create a tagged image file format (file extension.tif) for that portion of your report.

Note that you should continue to submit original photographs, which will be scanned, since digitized photographs do not print well.

If you chose to publish a compact disk (CD) of your publication, place on the CD copies of the manuscript in both (1) a portable document format (PDF); (2) a WordPerfect 8/9 file format, and (3) an Adobe Acrobat Reader, or, alternatively, print instructions for obtaining a free copy of Adobe Acrobat Reader on the back cover insert of the jewel box.

XI. QUALITY ASSURANCE

Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Public Law 106-554) directs the Office of Management and Budget (OMB) to issue government-wide guidelines (FR Vol. 67, No. 36, pp. 8452-8460) that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by federal agencies." NRC Information Quality Guidelines are provided in FR Vol. 67, No. 190, pp. 61695-61699.

The Contractor shall cite contractor quality assurance procedures used in the conduct of this work that provide for compliance with OMB and NRC guidelines.

XII. NRC-FURNISHED MATERIALS

No materials are to be furnished by the NRC during the performance of this work.

XIII. TECHNICAL AND OTHER SPECIAL QUALIFICATIONS REQUIRED

ISL shall provide personnel that are experienced in TRACE/PARCS development and the requirements for simulating the ACR-700 reactor design.

It is the responsibility of the contractor to assign technical staff, employees, subcontractors, or specialists who have the required educational background, experience, or combination thereof to meet both the technical objectives of the work specified in this SOW. The NRC will rely on representations made by the contractor concerning the qualifications of the personnel assigned to this task order including assurance that all information contained in the technical and cost proposal, including resumes, is accurate and truthful. In addition, the contractor and personnel assigned to this work must be approved for handling and working with proprietary information.

The use of key personnel and any proposed change to key personnel on this contract is subject to the NRC Project Manager's approval. This includes proposed use of principal persons (i.e., key contributors) during the life of the contract.

For any work to be subcontracted or performed by consultants ISL shall obtain the NRC Project Manager's written approval of the subcontractor or consultant prior to initiation of the subcontract effort. Conflict of interest considerations shall apply to any subcontracted effort.

XIV. CONFLICT OF INTEREST

List any work in the proposal that is similar to that previously performed or is to be performed by the contractor on behalf of another sponsor that might give rise to an apparent (perceived) or actual organizational conflict of interest, including duplication of effort.

XV. SUBCONTRACT/CONSULTING INFORMATION

Describe any technical support effort that is proposed to be performed by a subcontractor or consultant. Identify the level of effort, by task, of any proposed subcontractor or consultant and provide an explanation of the need for subcontracting that portion of the effort. Note that "pass through" contracting is not allowed under the requirements of the DOE/NRC Memorandum of Understanding. For the purposes of this effort, a "pass through" contract is generally defined as subcontracting 50 percent or more of the technical effort. For any subcontract or consultant effort, describe the following:

-the necessity of subcontracting,
-the tasks and sub-tasks the subcontractor or consultant will perform,
-the level of effort proposed for the subcontract effort,
-the conflict of interest considerations to be taken into account,
-the status and expected time frame for selection,
-the method of selection of the subcontractor or consultant.