

**AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT**

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2. AMENDMENT/MODIFICATION NO. M001	3. EFFECTIVE DATE NOV - 8 2006	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
6. ISSUED BY U.S. Nuclear Regulatory Commission Div. of Contracts Attn: Mail Stop T-7-I-2 Washington, DC 20555	CODE 3100	7. ADMINISTERED BY (If other than Item 6) U.S. Nuclear Regulatory Commission Div. of Contracts Mail Stop T-7-I-2 Washington, DC 20555	CODE 3100

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)  INFORMATION SYSTEMS LABORATORIES, INC ATTN: DR. JAMES F. MEYER  11140 ROCKVILLE PIKE, SUITE 500  ROCKVILLE MD 20852  CODE 107928806 FACILITY CODE	(X)	9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
		10A. MODIFICATION OF CONTRACT/ORDER NO. GS23F0060L DR-04-06-047, T001
	X	10B. DATED (SEE ITEM 13) 08-29-2006

**11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS**

The above numbered solicitation is amended as set forth in item 14. The hour and date specified for receipt of Offers  is extended,  is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:  
 (a) By completing Items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required) N/A

**13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.**

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
X	52.243-3 Changes--Time & Materials or Labor Hours
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority)

**E. IMPORTANT:** Contractor  is not,  is required to sign this document and return 2 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)  
 Refer to Purchase Order No. DR-04-06-047, Task Order No. 1 dated 8/29/2006; modify as follows:  
 Extend the period of performance from 8/10/06 through 12/22/06 and incorporate the attached Statement of Work at no additional cost to the Government.  
 Previous Obligated Amount: \$167,000.00  
 Increased/Decreased Amount: \$0.00  
 Total Obligated Amount: \$167,000.00  
 All other terms and conditions remain the same including the estimated ceiling amount of \$179,400.00.

Except as provided herein, all terms and conditions of the document referenced in item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) James F. Meyer, Senior V.P.	15A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Donald A. King
15B. CONTRACTOR/OFFEROR <i>[Signature]</i> (Signature of person authorized to sign)	15C. DATE SIGNED 11/2/06
16B. UNITED STATES OF AMERICA BY <i>[Signature]</i> (Signature of Contracting Officer)	16C. DATE SIGNED 10/20/06

STANDARD FORM 30 (REV. 10-83)

TEMPLATE - ADM001

**SUNSI REVIEW COMPLETE**

**ADM002**

**STATEMENT OF WORK**  
**NRC-04-06-047 TASK ORDER NO. 1**  
**Modification No. 1**

**TITLE:     Assessment of TRACE Code Predictions Against Experimental Data**

**I. BACKGROUND**

The TRACE code is being developed by the NRC to perform large and small break loss of coolant accident and system transient analysis for a wide range of nuclear plants. This code will be used as an audit tool to analyze transient and accident analyses submitted by vendors for licensing reactors. TRACE code predictions need to be assessed by comparing simulation results to experimental data. These comparisons help to quantify the conservatism of licensing calculations and ability of TRACE to model and simulate various thermal-hydraulic events.

**II. OBJECTIVE**

The objective of this work is to perform a series of developmental assessments of the thermal-hydraulic capabilities of the TRACE code by comparing and documenting code predictions against experimental data for the following areas of the existing TRACE Assessment Matrix:

A.2.4 Vertical Flow Pattern Map  
A.2.5 Horizontal Flow Pattern Map  
A.2.6 Single Phase Flow Pressure Drop  
A.2.7 Two-Phase Flow Pressure Drop  
B.7.1 UCB Condensation Tests  
B.7.2 Dehbi Wall Condensation Tests  
B.7.3 Univ. of Wisc. Condensation Tests  
B.10 PWR Component Test MIT ST-4  
C.1.2 CCTF  
C.1.3 SCTF  
ESBWR A.1.1 Ontario Hydro  
ESBWR A.1.2 Wilson Bubble Rise  
ESBWR B.2.1 PANDA ISP-42  
ESBWR B.2.2 PANDA M9

Numbers such as A.2.4 refer to the section in the TRACE Assessment Report.

**III. SCOPE OF WORK**

**Task 1:        Re-run “Fundamental Test Cases” from the TRACE Assessment Matrix**

A series of test cases designed to demonstrate basic two phase flow pressure drop and flow regime map behavior are to be simulated with the latest version of TRACE (Version 5.0RC1 or later, depending on availability). Input decks and AvScript inputs to simulate a series of experiments and make comparisons to data have been generated previously for the following assessment report sections:

A.2.4 Vertical Flow Pattern Map

A.2.5 Horizontal Flow Pattern Map  
A.2.6 Single Phase and Two Phase Pressure Drop

The cases associated with these report sections are to be re-run using the AVScript input files and code input decks obtained from the official TRACE test matrix repository available from the TRACE Developer's webpage (and not from local copies that the contractor may have stored on their own computers), the results compared to applicable experimental data, the figures (and their associated links) in the existing Framemaker report sections updated, and applicable report content updated, as necessary, to reflect the new results. As part of the code to data comparisons, code accuracy is to be quantified using performance metrics which will be defined by the Technical Monitor. All figures present in the Framemaker assessment report documents shall exist as separate files on disk and linked to using the "import by reference feature" of Framemaker. Exceptions to this requirement where it makes sense shall be approved by the NRC TRACE code caretaker. Links to the figures shall maintain the same relative directory structure as present in the TRACE assessment repository.

Any changes made to the code input models as a result of this assessment project shall be documented in a revised calculation notebook. All TRACE input files, AVScript files, calc notebook files, SNAP input files, and other extraneous scripts or files necessary to reproduce the work are to be retained for archival in the NRC data bank.

Estimated Level of Effort: 0.5 staff-months  
Estimated Completion Date: 1 month from start of task order

**Task 2: Re-run "Integral Effects Tests" from the TRACE Assessment Matrix**

A series of experiments performed in the Slab Core Test Facility (SCTF) and Cylindrical Core Test Facility (CCTF) are to be simulated with the latest version of TRACE, (Version 5.0RC1 or later, depending on availability). Input decks and AvScript inputs to simulate the experiments and make comparisons to data have been generated previously for the following:

- (A) SCTF Test S2-SH1 (Run 604) "Gravity reflood base case"
- (B) SCTF Test S2-SH2 (Run 605) "Gravity reflood, flat radial profile case"
- (C) SCTF Test S2-1 (Run 606) "Gravity reflood, steep radial profile test"
- (D) SCTF Test S2-02 (Run 607) "Gravity reflood, low pressure"
- (E) SCTF Test S2-06 (Run 611) "Gravity reflood, low pressure, steep radial profile"
- (F) SCTF Test S2-16 (Run 621) "Forced reflood test, counterpart to Run 611"
- (G) SCTF Test S2-17 (Run 622) "Forced reflood test, flat power profile"
- (H) CCTF Test C2-01 (Run 55) "High pressure test"
- (I) CCTF Test C2-04 (Run 62) "Reproducibility test"
- (J) CCTF Test C2-05 (Run 63) "Low power test"
- (K) CCTF Test C2-06 (Run 64) "Flat radial profile test"
- (L) CCTF Test C2-08 (Run 67) "Low pressure test"

- (M) CCTF Test C2-AA2 (Run 58) "Downcomer and CL combined injection test"
- (N) CCTF Test C2-12 (Run 71) "Best Estimate Reflood Test"

These cases are to be re-run using the AVScript input files and code input decks obtained from the official TRACE test matrix repository available from the TRACE Developer's webpage (and not from local copies that the contractor may have stored on their own computers), the results compared to applicable experimental data, the figures (and their associated links) in the existing Framemaker report sections updated, and applicable report content updated, as necessary, to reflect the new results. As part of the code to data comparisons, code accuracy is to be quantified using performance metrics which will be defined by the Technical Monitor. All figures present in the Framemaker assessment report documents shall exist as separate files on disk and linked to using the "import by reference feature" of Framemaker. Exceptions to this requirement where it makes sense shall be approved by the NRC TRACE code caretaker. Links to the figures shall maintain the same relative directory structure as present in the TRACE assessment repository.

Any changes made to the code input models as a result of this assessment project shall be documented in a revised calculation notebook. All TRACE input files, AVScript files, calc notebook files, SNAP input files, and other extraneous scripts or files necessary to reproduce the work are to be retained for archival in the NRC data bank.

Estimated Level of Effort: 3.0 staff-months  
Estimated Completion Date: 3 months from start of task order

**Task 3: Re-run "Separate Effects Tests" from the TRACE Assessment Matrix**

A series of separate effects experiments designed to study wall condensation phenomena and pressurizer behavior are to be simulated with the latest version of TRACE (Version 5.0RC1 or later, depending on availability). Input decks and AvScript inputs to simulate the experiments and make comparisons to data have been generated previously for the following assessment report sections:

- (A) UCB Condensation Tests (Series 1-4)
- (B) Dehbi Wall Condensation Tests
- (C) Univ. Of Wisconsin Condensation Tests
- (D) PWR Component Test MIT-ST-4

The cases associated with these report sections shall be re-run using the AVScript input files and code input decks obtained from the official TRACE test matrix repository available from the TRACE Developer's webpage (and not from local copies that the contractor may have stored on their own computers), the results compared to applicable experimental data, the figures (and their associated links) in the existing Framemaker report sections updated, and applicable report content updated, as necessary, to reflect the new results. As part of the code to data comparisons, code accuracy is to be quantified using

performance metrics which will be defined by the Technical Monitor. All figures present in the Framemaker assessment report documents shall exist as separate files on disk and linked to using the "import by reference feature" of Framemaker. Exceptions to this requirement where it makes sense shall be approved by the NRC TRACE code caretaker. Links to the figures shall maintain the same relative directory structure as present in the TRACE assessment repository.

Any changes made to the code input models as a result of this assessment project shall be documented in a revised calculation notebook. All TRACE input files, AVScript files, calc notebook files, SNAP input files, and other extraneous scripts or files necessary to reproduce the work are to be retained for archival in the NRC data bank.

Estimated Level of Effort: 2.0 staff-months  
Estimated Completion Date : 2 months from start of task order

**Task 4: Re-run "ESBWR Separate Effects Tests" from the TRACE Assessment Matrix**

A series of separate effects experiments designed to study phenomena important to the overall behavior of the ESBWR plant design are to be simulated with the latest version of TRACE (Version 5.0RC1 or later, depending on availability). Input decks and AvScript inputs to simulate the experiments and make comparisons to data have been generated previously for the following assessment report sections:

- (A) Ontario Hydro
- (B) Wilson Bubble Rise

The cases associated with these report sections shall be re-run using the AVScript input files and code input decks obtained from the official TRACE test matrix repository available from the TRACE Developer's webpage (and not from local copies that the contractor may have stored on their own computers), the results compared to applicable experimental data, the figures (and their associated links) in the existing Framemaker report sections updated, and applicable report content updated, as necessary, to reflect the new results. As part of the code to data comparisons, code accuracy is to be quantified using performance metrics which will be defined by the Technical Monitor. All figures present in the Framemaker assessment report documents shall exist as separate files on disk and linked to using the "import by reference feature" of Framemaker. Exceptions to this requirement where it makes sense shall be approved by the NRC TRACE code caretaker. Links to the figures shall maintain the same relative directory structure as present in the TRACE assessment repository.

Any changes made to the code input models as a result of this assessment project shall be documented in a revised calculation notebook. All TRACE input files, AVScript files, calc notebook files, SNAP input files, and other extraneous scripts or files necessary to reproduce the work are to be retained for archival in

the NRC data bank.

Estimated Level of Effort: 0.5 staff-months

Estimated Completion Date : 1 month from start of task order

**Task 5: Re-run “ESBWR Integral Effects Tests” from the TRACE Assessment Matrix**

A series of integral effects experiments designed to study phenomena specific to the ESBWR plant design are to be simulated with the latest version of TRACE (Version 5.0RC1 or later, depending on availability). Input decks and AvScript inputs to simulate the experiments and make comparisons to data have been generated previously for the following assessment report sections:

(A) PANDA ISP-42

(B) PANDA M9

The cases associated with these report sections shall be re-run using the AVScript input files and code input decks as obtained from the official TRACE test matrix repository available from the TRACE Developer’s webpage (and not from local copies that the contractor may have stored on their own computers), the results compared to applicable experimental data, the figures (and their associated links) in the existing Framemaker report sections updated, and applicable report content updated, as necessary, to reflect the new results. As part of the code to data comparisons, code accuracy is to be quantified using performance metrics which will be defined by the Technical Monitor. All figures present in the Framemaker assessment report documents shall exist as separate files on disk and linked to using the “import by reference feature” of Framemaker. Exceptions to this requirement where it makes sense shall be approved by the NRC TRACE code caretaker. Links to the figures shall maintain the same relative directory structure as present in the TRACE assessment repository.

Any changes made to the code input models as a result of this assessment project shall be documented in a revised calculation notebook. All TRACE input files, AVScript files, calc notebook files, SNAP input files, and other extraneous scripts or files necessary to reproduce the work are to be retained for archival in the NRC data bank.

Estimated Level of Effort: 2.0 staff-months

Estimated Completion Date : 2 months from start of task order

**IV. REPORTING REQUIREMENTS**

**1. Monthly Letter Status Report (MLSR)**

A MLSR is to be submitted to the NRC Project Manager by the 20<sup>th</sup> of the month following the month to be reported with copies provided to the following:

Office of Nuclear Regulatory Research Technical Monitor (Stephen Bajorek, Mail Stop T-

10 K08)

Division Management Analyst, (Janine Dehn, Mail Stop T-10E50)  
Division of Contracts, Office of Administration - an electronic copy only to Joyce Fields,  
email address [jaf1@nrc.gov](mailto:jaf1@nrc.gov) and to Beverly Anker, email address [bfa@nrc.gov](mailto:bfa@nrc.gov).

The MLSR 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. Updated assessment reports documenting the results from the TRACE calculations described in Tasks 1 - 5, as well as all modified AVScripts, input decks, and calc notebooks are to be prepared and provided to the staff by November 17, 2006.

#### **VI. MEETINGS AND TRAVEL REQUIREMENTS**

None.

#### **VII. LEVEL OF EFFORT**

The total level of effort is estimated at 8 staff-months at the Senior Engineer level.

#### **VIII. PERIOD OF PERFORMANCE**

The period of performance of this task order is August 10, 2006 through December 22, 2006.

#### **IX. TECHNICAL DIRECTION**

Technical direction will be provided by the Project Manager (William Macon) and the Technical Monitor (Stephen Bajorek), who can be reached at:

Mail Stop: (T-10 K08)  
U. S. Nuclear Regulatory Commission  
Washington DC 20555-0001  
Phone: (301) 415-6763  
Fax: (301) 415-5160  
Email: [ixm@nrc.gov](mailto:ixm@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
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.pdf
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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**

The NRC is expected to provide the final release candidate of the TRACE code by October 20, 2006. No other 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 thermal-hydraulic analysis.

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. REFERENCES AND ATTACHMENTS**

None.

#### **XV. 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.

#### **XVI. 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.

#### **XVII. LICENSE FEE RECOVERY**

The work specified in this SOW is not license fee recoverable.