

ORDER FOR SUPPLIES OR SERVICES

IMPORTANT: Mark all packages and papers with contract and/or order numbers.

BPA NO.

1. DATE OF ORDER 9/6/2012		2. CONTRACT NO. (if any) NRC-HQ-12-C-04-0087		6. SHIP TO:	
3. ORDER NO. NRC-HQ-12-T-04-0001		4. REQUISITION/REFERENCE NO. RES-12-144 dtd: 3/16/2012		a. NAME OF CONSIGNEE U.S. Nuclear Regulatory Commission	
5. ISSUING OFFICE (Address correspondence to) U.S. Nuclear Regulatory Commission Div. of Contracts Attn: Claudia G. Melgar, 301-492-3487 Mail Stop: TWB-01-B10M Washington, DC 20555				b. STREET ADDRESS Attn: Anders Gilbertson, 301-251-7592 Mail Stop: O4-A15A 11555 Rockville Pike	
7. TO:				c. CITY Washington	d. STATE DC
a. NAME OF CONTRACTOR ENERGY RESEARCH, INC.				f. SHIP VIA N/A	
b. COMPANY NAME				8. TYPE OF ORDER	
c. STREET ADDRESS 6189 EXECUTIVE BLVD				<input type="checkbox"/> a. PURCHASE <input type="checkbox"/> b. DELIVERY REFERENCE YOUR _____ Please furnish the following on the terms and conditions specified on both sides of this order and on the attached sheet, if any, including delivery as indicated.	
d. CITY ROCKVILLE		e. STATE MD	f. ZIP CODE 208523901		
9. ACCOUNTING AND APPROPRIATION DATA B&R: 2012-60-11-6-182; JCN: V6311; BOC: 252A; APPN: 31X0200 OBLIGATE: \$120,254.11; FAIMIS: 121774 DUNS: 621211259 NAICS: 541690 PSC: R413				10. REQUISITIONING OFFICE	
11. BUSINESS CLASSIFICATION (Check appropriate box(es))					12. F.O.B. POINT
<input checked="" type="checkbox"/> a. SMALL <input type="checkbox"/> b. OTHER THAN SMALL <input type="checkbox"/> c. DISADVANTAGED <input type="checkbox"/> d. WOMEN-OWNED <input type="checkbox"/> e. HUBZone <input type="checkbox"/> f. SERVICE-DISABLED VETERAN-OWNED <input type="checkbox"/> g. WOMEN-OWNED SMALL BUSINESS (WOSB) ELIGIBLE UNDER THE WOSB PROGRAM <input type="checkbox"/> h. EDWOSB					
13. PLACE OF		14. GOVERNMENT B/L NO.		15. DELIVER TO F.O.B. POINT ON OR BEFORE (Date)	
a. INSPECTION		b. ACCEPTANCE		16. DISCOUNT TERMS	

17. SCHEDULE (See reverse for Rejections)

ITEM NO. (a)	SUPPLIES OR SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)
	Issuance of Task Order Number 1 under contract Title: "MELCOR Input Model Support" Current Task Order Cost Ceiling: \$120,254.11 Total Obligated Amount: \$120,254.11 Period of Performance: 9/6/2012 - 8/5/2013-As stated in A.3 See Attachment #1 for Statement of Work See Clause A.4 for Contractor Acceptance					

SEE BILLING INSTRUCTIONS ON REVERSE	18. SHIPPING POINT		19. GROSS SHIPPING WEIGHT		20. INVOICE NO.		17(h) TOTAL (Cont. pages) 17(i) GRAND TOTAL
	21. MAIL INVOICE TO:						
	a. NAME Department of Interior / NBC NRCPayments@nbc.gov						
	b. STREET ADDRESS (or P.O. Box) Attn: Fiscal Services Branch - D2770 7301 W. Mansfield Avenue				PHONE: FAX:		
c. CITY Denver			d. STATE CO	e. ZIP CODE 80235-2230		6120,254.11	

22. UNITED STATES OF AMERICA BY (Signature) 	23. NAME (Typed) Jeffrey R. Mitchell Contracting Officer TITLE: CONTRACTING/ORDERING OFFICER
--	---

Table of Contents

SECTION A - CONTINUATION BLOCK.....	A-2
A.1 PRICE/COST SCHEDULE	A-2
A.2 CONSIDERATION AND OBLIGATION COST-PLUS-FIXED-FEE (AUG 2011) ALTERNATE I (AUG 2011)	A-3
A.3 TASK/DELIVERY ORDER PERIOD OF PERFORMANCE (AUG 2011)	A-3
A.4 CONTRACTOR ACCEPTANCE OF TASK ORDER 01	A-3
SECTION C - STATEMENT OF WORK.....	C-1

SECTION A -

A.1 PRICE/COST SCHEDULE

BASE PERIOD: Data provided through August 31, 2013				
LINE NO.	DESCRIPTION OF SUPPLIES/SERVICES	ESTIMATED COST	FIXED FEE	ESTIMATED TOTAL FEE
001	The contractor shall support the development of the Level 1 and Level 2 portion of the full-scope site Level 3 PRA by using the NRC's MELCOR Integral Severe Accident Analysis Code for T-H analyses for applications such as success criteria analysis, accident sequence timing, and severe accident progression modeling.			
Total				\$120,254.11

**A.2 CONSIDERATION AND OBLIGATION—COST-PLUS-FIXED-FEE (AUG 2011)
ALTERNATE I (AUG 2011)**

(a) The total estimated cost to the Government for full performance of this task order is \$120,254.11, of which the sum of \$112,698.29 represents the estimated reimbursable costs, and of which \$7,555.82 represents the fixed-fee.

(b) There shall be no adjustment in the amount of the Contractor's fixed fee.

(c) The amount currently obligated by the Government with respect to this contract is \$120,254.11, of which the sum of \$112,698.29 represents the estimated reimbursable costs, and of which \$7,555.82 represents the fixed-fee.

(d) It is estimated that the amount currently obligated will cover performance through the life of the task order.

(e) In accordance with FAR 52.216-8 - Fixed Fee, it is the policy of the NRC to withhold payment of fee after payment of 85 percent of the fee has been paid in order to protect the Government's interest. The amount of fixed-fee withheld from the contractor will not exceed 15 percent of the total fee or \$100,000, whichever is less. Accordingly, the maximum amount of fixed-fee that may be held in reserve is \$1,133.00.

A.3 TASK/DELIVERY ORDER PERIOD OF PERFORMANCE (AUG 2011)

This order shall commence on September 6, 2012 and will expire on August 5, 2013.

A.4 CONTRACTOR ACCEPTANCE OF TASK ORDER NRC-HQ-12-T-04-0001

Acceptance of Task Order No. NRC-HQ-12-T-04-0001 under NRC-HQ-12-C-04-0087 should be made by having an official, authorized to bind your organization, execute two copies of this document in the space provided and return one copy to the Contracting Officer. You should retain the other copy for your records.

Accepted Task Order No. NRC-HQ-12-T-04-0001, under NRC-HQ-12-C-04-0087:

John Kuczi-RM
Name

President
Title

9/6/12
Date

SECTION C

CONTRACT NO: NRC-HQ-12-C-04-0087

TASK ORDER NO: NRC-HQ-12-T-04-0001

TITLE: MELCOR Input Model Support

JCN: V6311

B&R NUMBER: 2012-60-11-6-182

NRC PROJECT OFFICER: Anders Gilbertson, 301-257-7592
Anders.Gilbertson@nrc.gov

NRC CONTRACT SPECIALIST: Claudia Melgar, 301-492-3487
Claudia.Melgar@nrc.gov

1.0 BACKGROUND

Deterministic T-H modeling and analyses are central to the development of a probabilistic risk assessment (PRA) model. These models and analyses are used to determine or confirm the anticipated behavior of reactor systems and model severe accident phenomena during the course of a reactor accident. The results of the analyses serve as the basis for many of the assumptions used in a PRA model. As such, the T-H models and analyses must adequately represent those systems and phenomena that are being modeled so that the PRA represents realistic plant response to various accident scenarios.

This thermal-hydraulic (T-H) and severe accident progression modeling and analysis support project will assist the NRC staff in the development of a full-scope site Level 3 PRA for a NRC-licensed nuclear power plant site. The insights gained from the development and completion of this Level 3 PRA will be used to enhance regulatory decision-making and help focus limited agency resources on issues more directly related to the agency's mission to protect public health and safety.

2.0 TASK ORDER OBJECTIVE

The objective of this Task Order is to support the development of the T-H aspects of the Full-Scope Site Level 3 PRA Project by developing a MELCOR input model specific to the selected subject plant site.

3.0 SCOPE OF WORK

The contractor shall support the development of the Level 1 and Level 2 portion of the full-scope site Level 3 PRA by using the NRC's MELCOR Integral Severe Accident Analysis Code for T-H analyses for applications such as success criteria analysis, accident sequence timing, and severe accident progression modeling. The contractor shall adapt an existing MELCOR model from a plant site (most likely Byron, a 4-loop pressurized-water reactor of Westinghouse design) that is similar to the subject plant site.

4.0 SPECIFIC TASKS

4.1- Task 1: Review of Supporting Material

Requirements: Within two weeks of Task Order award, the NRC Contracting Officer Representative (COR) will identify the subject plant site to be used for development of the MELCOR model and provide relevant plant-specific documentation for that site. This documentation will include, but is not limited to, the Final Safety Analysis Report, Emergency Operating Procedures, Technical Specifications, licensee training materials, licensee-provided inputs to their own T-H models and analyses (e.g., MAAP code model), and any available representative TRACE model.

The contractor shall review the input models and plant-specific documentation described above for the plant to be modeled. As part of the information review process, the contractor will be required to aggregate disparate information and assimilate and make judgments, in consultation with NRC staff, about what available information is best to use for adapting the approximate input model to the subject plant site. It should be noted that since a best-approximate MELCOR model from a similar plant site will be used as a starting point for the development of the subject plant site model, the model may potentially require significant adaptation to adequately represent the subject plant site. At the end of this review, the contractor shall provide a summary of the information reviewed and identify any needed and missing information that has been identified, such that the NRC COR can obtain this information from the licensee or other sources.

Standard: All deliverables shall be provided on time to the NRC Contracting Officer Representative (COR) and NRC Contracting Officer (CO).

Deliverable: Two months after Task Order award, the Contractor shall submit a few-page letter report providing a summary of the information reviewed and identification of any needed and missing information that has been identified.

4.2 Task 2: Development of Initial Input Model and Calculation Notebook

Requirements: Three months after Task Order award, if feasible, the NRC COR will coordinate a site visit or teleconference with plant engineering and operations staff to ensure that the contractor has a sound understanding of the plant design and operation. If for some reason this is not feasible, the NRC COR will coordinate information exchanges between the contractor and the a) licensee, b) licensee's corporate engineering group or consultant firm, and/or c) cognizant NRC Senior Reactor Analyst.

The resources associated with this task include those necessary to support these interactions; however travel expenses are addressed separately.

Using the material provided in the information exchanges described above, and the supporting material provided in Task 1A, the contractor shall develop a plant-specific MELCOR model for the subject plant-site using established best practices for MELCOR for all systems, structures, and components needed for general purpose Level 1 PRA success criteria and sequence timing use and Level 2 severe accident progression modeling and analysis. This includes scenarios covered (e.g., loss of all AC power, loss-of-coolant accidents) in the August 2009 Success Criteria report, available in the Agencywide Documents Access and Management System (ADAMS) at ML091890792. Automatic plant responses (e.g., automatic reactor and turbine trips, automatic feedwater control) shall be included in the model. The general level of modeling is expected to be commensurate with that of the Surry model (as invoked in the August 2009 report). The contractor shall document the basis for all inputs into the MELCOR input model as well as a supporting discussion of the model's use.

Standard: All deliverables shall be provided on time to the NRC COR and NRC CO.

Deliverable: Four months after Task Order award date, the contractor shall submit a draft of the calculation notebook.

4.3- Task 3: Input Model and Calculation Notebook Quality Assurance Review

Requirements: The model and calculation notebook shall be reviewed, in detail, by a qualified member of the contractor staff who was not primarily involved with the development of the model and documentation. Errors shall be corrected, and the documentation shall be updated.

Standard: All deliverables shall be provided on time to the NRC COR and NRC CO.

Deliverable: Six months after Task Order award the contractor shall submit a few-page letter report documenting the quality assurance review process and findings and confirming that all identified issues have been corrected.

4.4- Task 4: Conduct and Documentation of Model Shakedown Analysis

Requirements: The contractor shall formulate a calculation matrix, in consultation with the NRC COR, to perform (and document) debugging and testing of the input model. Results shall be compared to similar sequences in the August 2009 report (referenced in Task 2), the Westinghouse Emergency Operating Procedures bases documentation, and/or other industry/NRC reports. From a resource planning standpoint, it should be assumed that the calculation matrix will be comprised of 15 sequences covering 5 initiating events. The documentation of this analysis shall be commensurate with the analysis documentation in the August 2009 report (main report and Appendix A), referred to in Task 2

Standard: All deliverables shall be provided on time to the NRC COR and NRC CO.

Deliverable: Seven months after Task Order award the contractor submits a letter report documenting the interim final shakedown analysis.

4.5- Task 5: Final Input Model / Documentation and Technical Assistance

Requirements: Eight months after Task Order award, the NRC will provide any significant comments on the shakedown analysis letter report or draft calculation notebook. This task also includes a small amount of resources for responding to inquiries and participating in meetings related to the development and use of the model.

Standard: The final input models, calculation notebook, and shakedown analysis documentation shall be transmitted to the NRC COR via CD or DVD.

Deliverable: Nine months after Task Order award the contractor shall provide all input models (organized in an easily identifiable manner), the final calculation notebook, and the final shakedown analysis report.

4.6- Task 6: Model Maintenance and Updating

Requirements: The developed input model shall be maintained and updated by the contractor to ensure its continued fidelity (e.g., incorporating significant plant changes into the model) and utility (e.g., ensuring model compatibility with new versions of the MELCOR code). The maintenance needs of the input model will evolve based on the needs of the Full-Scope Site Level 3 PRA Project, which may be impacted by the PRA peer review, code development activities, and model development under other projects. Documentation of model maintenance activities shall be provided by the contractor to the NRC COR and shall include, at a minimum, the updated model and the updated calculation notebook.

Standard: All deliverables shall be provided on time to the NRC COR and NRC CO.

Deliverable: Two months after identification of activity the contractor shall submit memos or letter reports documenting model upgrade/maintenance activity.

5.0 TECHNICAL AND OTHER SPECIAL QUALIFICATIONS REQUIRED

This Task Order requires in-depth knowledge and expertise in the development of the T-H and severe accident modeling aspects associated with the development of a full-scope site Level 3 PRA for a nuclear power plant (NPP). This in-depth knowledge and expertise includes, but is not limited to, the following areas:

- MELCOR Expertise for NPP applications:
 - MELCOR input model development
 - execution and debugging of MELCOR models

- NPP Accident Analysis Expertise:
 - NPP design and operation
 - NPP response to accident initiators and mitigating system behavior
 - NPP severe accident phenomena

In addition, in-depth knowledge and expertise of the development of the T-H and severe accident progression modeling and analysis for non-reactor sources of radiological material (i.e., spent fuel pools and dry cask fuel storage) is desired, but is not critical to the performance of this Task Order.

In some instances, the NRC's TRACE code may be used instead of the MELCOR code. As such, familiarity with the TRACE computer code is desired, but is not necessary for performance of this Task Order.

Contractors shall be technically creditable to respond to technical questions during presentations to the Advisory Committee on Reactor Safeguards (ACRS). The contractor's technical credibility will be based on their in-depth knowledge of NPP T-H and severe accident progression modeling and analysis resulting from their education and work experience.

If a site visit becomes necessary for the work under this Task Order, the contractor staff may need to complete the NRC's site access training. The NRC COR will facilitate this training completion, along with attaining the necessary site access authorization for escorted nuclear power plant access.

The labor categories anticipated for this project are listed below with their descriptions:

Senior Engineer/Analyst (or equivalent)

Individuals that are proposed to work under this labor category shall possess a minimum of 15 years of technical experience and 5 years of project management experience. The minimum educational requirements are a Ph.D. or Master's degree in a recognized engineering or scientific field from an accredited program of study. Equivalent experience in a science or engineering field may be considered. These individuals shall also have multiple scientific publications and have extensive peer recognition as an authority in his/her field of study.

Technical experience shall consist largely of the in-depth knowledge and expertise discussed in the first paragraph of this section ("Technical and Other Special Qualifications Required"), and should also include technical experience with applied research, technical analysis, technical support activities, and independent problem solving. Project management experience shall include experience with directing work under technical projects and with multiple personnel. Experience with directing NPP T-H or severe accident progression modeling projects is preferred.

Engineer/Analyst (or equivalent)

Individuals that are proposed to work under this labor category shall possess a Bachelor's or Master's degree of Science in addition to the specific technical experience described in the next paragraph. The academic degree shall be for a recognized engineering or scientific field from an accredited program of study. An Engineer/Analyst is expected to perform detailed T-H or severe accident progression modeling and analysis with some direction from the Senior Engineer/Analyst, but should possess enough understanding of the work involved to make independent technical decisions.

Technical experience shall, at a minimum, consist of familiarity with performing detailed T-H or severe accident progression modeling and analysis. Specifically, this familiarity should include

1) at least 5 years of experience with severe accident progression modeling and analysis, of which at least 2 years of this experience should include the use of the MELCOR computer code and analysis of MELCOR results; and 2) a significant understanding of the technical areas listed in the first paragraph of this section ("Technical and Other Special Qualifications Required").

6.0 REPORTING REQUIREMENTS

Required deliverables are outlined in Section 4 of this Statement of Work. All letter reports shall be reviewed by a first-level supervisor prior to submittal. All deliverables shall be submitted electronically, via email, to the NRC COR and CO. No more than three hardcopies of any deliverable shall be submitted, unless specifically requested by the NRC COR.

7.0 MEETINGS AND TRAVEL

Meetings that are conducted remotely via teleconference will be held on an as-needed basis. The following travel requirements are anticipated for this Task Order. All trip durations include consideration of travel times:

- One two-person trip for two days to NRC Headquarters for the post-award kickoff meeting.
- One two-person trip for three days to the subject plant site (location to be determined) for information gathering and discussions with plant personnel.
- Two two-person trips for three days project status and discussion of technical issues.

8.0 NRC-FURNISHED MATERIAL

The NRC COR will provide all available and necessary plant documentation (FSAR, EOPs, Technical Specifications, PRA system notebooks, training materials, past amendment requests). Similarly, access to the SNAP, TRACE, and MELCOR computer codes and the relevant models will be granted within the normal operating constraints for providing this information (e.g., a non-disclosure agreement may be necessary).

In addition, NRC will provide access to agency PRA tools as necessary, and within the constraints placed upon dissemination of the information. The contractor, and any authorized subcontractors, may use NRC SPAR models and the NRC SAPHIRE PRA computer code to evaluate scenarios. Any problems encountered using the SAPHIRE code or the SPAR models shall be discussed with the NRC COR and documented in the MLSR. The documentation should describe in detail the problem or difficulty encountered and the steps taken to resolve the problem.

The NRC will provide access to the SPAR models and the NRC SAPHIRE PRA computer code. The contractor, and any authorized subcontractors, will use their own personal computers for running SAPHIRE and the SPAR models. The contractor, and any authorized subcontractors, will provide the names, phone numbers, company affiliation, title, mailing address and citizenship of any staff that will need access to the SPAR models. The SPAR models are being provided only for the contractor/subcontractor's use and are not to be distributed further without the written

consent of the Nuclear Regulatory Commission. Due to the sensitivity of the information contained in the models, they are not publicly available. Additionally, a non-disclosure agreement must be completed in order to obtain the SAPHIRE computer code. The NRC will also provide Web access to the Accident Sequence Precursor and operating event databases, if necessary. The use of these materials and SPAR models is limited to the period of performance of this contract and to the individuals approved by NRC for access.

WEIGHTED GUIDELINES PROFIT/FEE OBJECTIVES

OFFEROR: Energy Research, Inc proposal Initial submission

RFP OR CONTRACT NUMBER: NRC-HQ-12-C-04-0087

<u>COST ELEMENTS</u>	<u>GOVERNMENT'S COST OBJECTIVE</u>	<u>RANGE</u>	<u>ASSIGNED WEIGHT</u>	<u>WEIGHTED PROFIT/FEE</u>
1) Professional Labor: Divide cost by 4750 hours \$ 63.83 DPH	<u>\$ 303,171.93</u>	(9%-15%)*	<u>15.0%</u>	<u>\$ 45,475.79</u>
2) Non-Professional Labor: Divide cost by 0 hours \$ DPH	<u>\$ -</u>	(6%-9%)	<u>6%</u>	<u>\$ -</u>
3) Overhead, Fringe Benefits, and G&A	<u>\$ 205,520.63</u>	6%	<u>6%</u>	<u>\$ 12,331.24</u>
4) Subcontracts:	<u>\$ -</u>	5%	<u>5%</u>	<u>\$ -</u>
5) Consultants: 0 hours Consultants % of Total Labor Hours:	<u>\$ -</u>	(3%-7%)	<u>6%</u>	<u>\$ -</u>
		0%		(Consultant Hours/Sum of Prof. & Cons. Labor Hours)
6) Other Direct Costs:	<u>\$ 3,600.00</u>	1%	<u>1%</u>	<u>\$ 36.00</u>
Travel:	<u>\$ 4,938.00</u>	0%	<u>0%</u>	<u>\$ -</u>

TOTAL GOVERNMENT COST OBJECTIVE: \$ 57,843.03

7) Cost Risk: (CPFF)	<u>\$ 517,230.56</u>	(0%-7%)	<u>0%</u>	<u>\$ -</u>
8) Selected Factors		(-2%/+2%)		<u>\$ -</u>

OBJECTIVE: \$ 57,843.03

PROPOSED BY CONTRACTOR: \$ 35,860.48 6.93%
GOVERNMENT WGL: \$ 57,843.03 11.18%

It is recommended that the Government accept the Contractor's proposed fee of \$35,860.48 as it is lower than the Government's WGL analysis.



Claudia Melgar, Contract Specialist
Reactors, Safety and Licensing Branch

9/5/2012

Date

*According to FAR 15.404-4 (c)(4)(i) The contracting officer shall not negotiate a price or fee that exceeds the following statutory limitations, imposed by 10 U.S.C. 2306(d) and 41 U.S.C. 254(b):
(A) For experimental, developmental, or research work performed under a cost-plus-fixed-fee contract, the fee shall not exceed 15 percent of the contract's estimated cost, excluding fee.