

ORDER FOR SUPPLIES OR SERVICES

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

BPA NO. NRC-DR-04-09-141

1. DATE OF ORDER 2/10/11	2. CONTRACT NO. (if any) GS23F0100M	6. SHIP TO:	
3. ORDER NO. NRC-T002	MODIFICATION NO.	4. REQUISITION/REFERENCE NO. RES-11-076 Dated: 12/16/2010	
5. ISSUING OFFICE (Address correspondence to) US Nuclear Regulatory Commission Attn: Ashlee Bushell, 301-492-3486 Mail Stop: TWB-01-B10M Washington DC 20555		a. NAME OF CONSIGNEE US Nuclear Regulatory Commission	
		b. STREET ADDRESS Attn: Imtiaz Madni Mail Stop: C2A07M	
		c. CITY Washington	d. STATE DC
		e. ZIP CODE 20555	

7. TO:		f. SHIP VIA	
a. NAME OF CONTRACTOR ENERGY RESEARCH, INC.		8. TYPE OF ORDER	
b. COMPANY NAME		<input type="checkbox"/> a. PURCHASE <input checked="" type="checkbox"/> b. DELIVERY	
c. STREET ADDRESS 6189 EXECUTIVE BLVD		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 Obligate: \$100,000 B&R: 2011-60-17-6-100 Job: V6209 BOC: 252A Approp.: 31X0200.160 FFS: 110988 DUNS: 621211259 NAICS: 541330		10. REQUISITIONING OFFICE RES	
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11. BUSINESS CLASSIFICATION (Check appropriate box(es))				12. F.O.B. POINT Destination	
<input checked="" type="checkbox"/> a. SMALL	<input type="checkbox"/> b. OTHER THAN SMALL	<input type="checkbox"/> c. DISADVANTAGED	<input type="checkbox"/> g. SERVICE-DISABLED VETERAN-OWNED		
<input type="checkbox"/> d. WOMEN-OWNED	<input type="checkbox"/> e. HUBZone	<input type="checkbox"/> f. EMERGING SMALLBUSINESS			

13. PLACE OF		14. GOVERNMENT B/L NO.		15. DELIVER TO F.O.B. POINT ON OR BEFORE (Date)		16. DISCOUNT TERMS	
a. INSPECTION destination	b. ACCEPTANCE destination						

17. SCHEDULE (See reverse for Rejections)

ITEM NO. (e)	SUPPLIES OR SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)
	The contractor shall provide the services in the attached statement of work in accordance with the terms and conditions of the BPA and this order. Total Order Ceiling: \$159,644.75 Total Obligated amount \$100,000.00 Period of Performance: Award date - February 10, 2012. Acceptance: <i>Moh Kueh-Ru</i> Signature _____ Date _____					

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 National Business Center						
	b. STREET ADDRESS (or P.O. Box) Attn: Fiscal Services Branch - D2770 7301 W. Mansfield Avenue						
c. CITY Denver		d. STATE CO	e. ZIP CODE 80235-2230				

22. UNITED STATES OF AMERICA BY (Signature) <i>Adelis M. Rodriguez</i>	23. NAME (Typed) Adelis M. Rodriguez Contracting officer TITLE: CONTRACTING/ORDERING OFFICER
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TASK ORDER TERMS AND CONDITIONS

A.1 PRICE SCHEDULE

Award date - December 31, 2011

Labor category	Labor Rate	Est. hours	Total
Executive	[REDACTED]	[REDACTED]	[REDACTED]
Executive Engineer Scientist	\$ [REDACTED]	0	\$0.00
Senior Engineer / Scientist	[REDACTED]	[REDACTED]	[REDACTED]
Engineer / Scientist	[REDACTED]	0	\$0.00
System Analyst	[REDACTED]	0	\$0.00
Support Staff	[REDACTED]	0	\$0.00
Senior Consulting Engineer	\$ [REDACTED]	0	\$0.00
Executive Consulting Engineer	[REDACTED]	0	\$0.00
Total Labor			\$143,959.75
Other direct costs			[REDACTED]
Travel			[REDACTED]
TOTAL			\$146,049.75

January 1, 2011 end of year 1 (est. February 10, 2012)

Labor category	Labor Rate	Est. hours	Total
Executive	[REDACTED]	[REDACTED]	[REDACTED]
Executive Engineer Scientist	\$ [REDACTED]	0	\$0.00
Senior Engineer / Scientist	[REDACTED]	[REDACTED]	[REDACTED]
Engineer / Scientist	[REDACTED]	0	\$3,663.40
System Analyst	[REDACTED]	0	\$0.00
Support Staff	\$ [REDACTED]	0	\$0.00
Senior Consulting Engineer	\$ [REDACTED]	0	\$0.00
Executive Consulting Engineer	[REDACTED]	0	\$0.00
Total Labor			[REDACTED]
Other direct costs			[REDACTED]
Travel			\$0.00
TOTAL			\$13,595.00

Task 1 Summary

Labor category	Labor Rate	Est. hours	Total
Executive		315	\$49,057.75
Executive Engineer Scientist		0	\$0.00
Senior Engineer / Scientist		1215	\$108,427.00
Engineer / Scientist		0	\$0.00
System Analyst		0	\$0.00
Support Staff		0	\$0.00
Senior Consulting Engineer		0	\$0.00
Executive Consulting Engineer		0	\$0.00
Total Labor		1530	\$157,524.75
Other direct costs			\$500.00
Travel			\$1,240.00
TOTAL			\$159,644.75

A.2 CONSIDERATION AND OBLIGATION - LABOR HOUR CONTRACT

- (a) The total not to exceed cost to the Government for full performance of this contract is \$159,644.75.
- (b) The amount currently obligated by the Government with respect to this contract is \$100,000.00. The contractor shall not exceed this obligated amount at any time.
- (c) It is estimated that the amount currently allotted will cover performance through October 31, 2011.

**STATEMENT OF WORK FOR COMMERCIAL
NRC-04-09-141, Task Order No. 2**

TITLE: Technical Assistance for Thermal-Hydraulics and Severe Accidents for Pre-Application and Design Certification of Advanced Reactors
(TASK 2 - MELCOR Modeling and Analysis of Accidents for an IPWR)

1.0 BACKGROUND

The United States Nuclear Regulatory Commission (NRC), Office of Nuclear Regulatory Research (RES), is providing support to the NRC's New Reactors Office (NRO) in the integrated Pressurized Water Reactors (iPWRs) pre-application and design certification review activities. There are a number of unique features in the iPWR that are specifically designed to help mitigate the consequences of severe accidents. As part of this effort, NRC staff is planning to examine the modeling challenges and analysis results in the application of MELCOR to these small, modular iPWRs under various postulated accident conditions.

2.0 OBJECTIVE

The primary objective of the planned activity is to develop and document a preliminary MELCOR 1.8.6 input model for an iPWR (e.g., mPower) that is consistent with the contemporary NRC MELCOR modeling approach for other iPWRs (e.g., NuScale).

3.0 SCOPE OF WORK

Task 1: Development of a Preliminary MELCOR Input Model for an iPWR

The contractor shall extract the required design data from various submittals by B&W Inc. for mPower to develop a MELCOR 1.8.6 input model consistent in terms of nodalization to other recently developed MELCOR input decks. The model shall include the reactor core, a single straight-tube once-through steam generator, a pressurizer, primary coolant pumps, and control rod drive mechanisms (CRDMs) that are integrated into the reactor vessel. In addition, models shall be developed for other features in this design that may be important to progression of accidents (e.g., ECCS, decay heat removal systems, etc.).

This iPWR will be equipped with a steel-lined, reinforced concrete, dry containment that is similar to conventional PWR containment buildings. The containment is planned to be embedded underground.

The input deck shall be supported by detailed calculation notes that can be readily submitted to an independent Quality Assurance (QA) review, if needed. The initial input deck shall be tested under full-power (pre-accident) steady state conditions to verify that the key reactor and plant parameters hold close to nominal values, thus ensuring that the input parameters are consistent in the model.

Task 2: Transient Testing of Preliminary Input deck and Documentation

The contractor shall test the preliminary input deck developed under Task 1 for reasonableness by performing a preliminary sample transient/accident calculation and comparing the calculated trends to those that may be performed by the applicant and become available at a later date. In areas where the existing MELCOR model is found to be deficient in representing a specific design feature, reasonable workarounds may become necessary, and shall be devised. Based on this testing, the contractor shall update the preliminary input deck and prepare detailed documentation of the input model and sample calculations.

4.0 RESEARCH QUALITY

The quality of NRC research programs are assessed each year by the Advisory Committee on Reactor Safeguards. Within the context of their reviews of RES programs, the definition of quality research is based upon several major characteristics:

- Results meet the objectives ([REDACTED] of overall score)
- Justification of major assumptions ([REDACTED])
- Soundness of technical approach and results [REDACTED]
- Uncertainties and sensitivities addressed [REDACTED]

- Documentation of research results and methods is adequate ([REDACTED] overall score)
- Clarity of presentation ([REDACTED])
- Identification of major assumptions ([REDACTED])

It is the responsibility of the contractor to ensure that these quality criteria are adequately addressed throughout the course of the research that is performed. The NRC project manager and technical monitor will review all research products with these criteria in mind.

5.0 TECHNICAL AND OTHER SPECIAL QUALIFICATIONS REQUIRED

The contractor shall provide personnel that are experienced in thermal hydraulics, severe accident analyses, risk assessment, MELCOR input deck development, code assessment, and applications to Advanced LWRs.

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 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 the contractor 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.

6.0 PERIOD OF PERFORMANCE

Twelve months (February 10, 2011 – February 9, 2012)

7.0 PLACE OF PERFORMANCE

All work performed under this contract shall be performed primarily at the contractor's site, except when the contractor needs to be on-site at NRC Headquarters in Rockville, MD, for meetings and discussions, and off-site locations designated by NRC Project Officer.

8.0 REPORTING REQUIREMENTS

1. The contractor shall prepare technical reports as described under "Deliverables and Delivery Schedule."
2. Monthly Letter Status Report (MLSR)

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

RESDSAMLSR.Resource@nrc.gov
ContractsPOT.Resource@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.

9.0 PUBLICATIONS NOTE

RES encourages the publication of the scientific results from RES sponsored programs in refereed scientific and engineering journals as appropriate. If the laboratory proposes to publish in the open literature or present the information at meeting in addition to submitting the required technical reports, approval of the proposed article or presentation should be obtained from the NRC Project Manager. The RES Project Manager shall either approve the material as submitted, approve it subject to NRC suggested revisions, or disapprove it. In any event, the RES Project Manager may disapprove or delay presentation or publication 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 3.7, "NUREG Series Publications," and 3.9, "NRC Staff and Contractor Speeches, Papers, and Journal Articles on Regulatory and Technical Subjects."

If the presentation or paper is in addition to the required technical reports and the RES Project Manager determines that it will benefit the RES project, the Project Manager may authorize payment of travel and publishing costs, if any, from the project funds. If the Project Manager determines that the article or presentation would not benefit the RES project, the costs associated with the preparation, presentation, or publication will be borne by the contractor. For any publication or presentations falling into this category, the NRC reserves the right to require that such presentation or publication 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) began to capture most of its official records electronically on January 1, 2000. The NRC will capture each final NUREG-series publication in its native application. Therefore, please 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 Manager for the publication of the assigned designator when the final manuscript is sent to the printer.

For the electronic manuscript, the Contractor shall prepare the text in Microsoft Word, 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
Microsoft®Word®	.doc
Microsoft® PowerPoint®	.ppt
Microsoft®Excel	.xls
Microsoft®Access	.mdb
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 Microsoft Word 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.

10.0 DELIVERABLES/SCHEDULES AND/OR MILESTONES

Number	Deliverable	Due Date
1a	Preliminary Input Deck and detailed draft calculation notes	+8 months after award date
1b	Steady State & Sample Transient/Accident Calculations	+8 months after award date
2a	Draft Report on Revised MELCOR Model and Analyses	+3 months after "1b"
2b	Final Report on MELCOR Model and Analyses following NRC comments	+ 1 month after "2a"

The contractor shall review technical reports to ensure they are of high quality. The format of technical reports should follow generally accepted technical writing practices (see NUREG-650, Revision 2, "Publishing Documents in NUREG Series"). The authors must consider the audience who read the documents; link ideas in sentences and paragraphs to create an easy-to-follow logical transition; and ensure consistency of terminology, format, and style throughout.

The reports should be well focused (i.e., they should not be too wordy and the prose should flow in logical manner). The authors must provide necessary information to avoid administrative, managerial, or fiscal information unsuitable for wide dissemination. They should not contain proposals for additional work and words should be carefully selected to avoid marketing of contractor capabilities.

11.0 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.

12.0 MEETINGS AND TRAVEL

The contractor shall plan on attending meetings (up to four visits for one person, for one day) at the NRC Headquarters in Rockville, Maryland. For planning purposes, the contractor may attend an additional trip to the mPower corporate offices for three days for two people. Any domestic travel must be approved in advance by the NRC Project Manager.

13.0 NRC-FURNISHED MATERIALS

The NRC will provide to the contractor information and design data for NuScale and any available input data that is provided by the applicant. Proprietary submitted documentation will be provided by the NRC in the form of CD-ROMs.

The contractor shall be responsible for the protection of all NRC documentation in its possession during the course of contract performance in accordance with the procedures as set forth in NRC's policy entitled, Sensitive Unclassified Non-Safeguards Information (SUNSI), Handling Requirements for Proprietary Information.

14.0 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.

15.0 TECHNICAL DIRECTION

Technical direction will be provided by the Project Manager, Imtiaz Madni, who can be reached at:

U. S. Nuclear Regulatory Commission

Mail Stop: CSB – 3A07M

Washington, D. C. 20555-0001

Phone: (301) 251-7493

Fax: (301) 251-7423

Email: Imtiaz.Madni@nrc.gov

Express mail should be sent to:

U. S. Nuclear Regulatory Commission

Mail Stop: CSB – 3A07M

11545 Rockville Pike

Rockville, MD 20852-2738